Meridian 1

ISDN PRI

Maintenance

Document Number: 553-2901-501
Document Release: Standard 6.00
Date: January 2002

Printed in Canada

Revision history

January 2002

Standard 6.00. This document is up-issued to to include content changes for Meridian 1 Release 25.40.

April 2000

Standard 5.00. This is a global document and is up-issued for X11 Release 25.0x. Document changes include removal of: redundant content; references to equipment types except Options 11C, 51C, 61C, and 81C; and references to previous software releases.

October 1997

Issue 4.00 released as Standard for Generic X11 Release 23.00.

December 1995

Issue 3.00 released as Standard for Generic X11 Release 21.1x.

August 1995

Issue 2.00 released as Standard for Generic X11 Release 21.0x.

August 1994

Issue 1.00 released as Standard for Generic X11 Release 20.00.

August 1993

This document is the standard release for Phase 8b.

October 1992

This document is the standard release for Phase 7C.

June 1992

This publication is the standard release for Phase 7B.

December 1991

This publication is the standard release for Group F (Phase 6B iii).

July 1991

This publication is the standard release for Phase 5.

Contents

About this document

This document applies to Meridian 1 Internet Enabled systems.

This document is a global document. Contact your system supplier or your Nortel Networks representative to verify that the hardware and software described is supported in your area.

This document provides operation and maintenance procedures for ISDN Primary Rate Interface (PRI) capability on Meridan 1 Options 51C, 61C, and 81C.

PRI fault clearing

Contents

The following are the topics in this section:

PRI red alarm (local alarm)

A PRI local alarm can indicate:

- 1.5 Mb/2.0 Mb digital transmission problems
- a PRI card fault

Under any of these alarm conditions, all 24/30 B-channels are taken out of service, and:

1 The PRI local alarm faceplate LED is lit.

2 Calls on the PRI are disconnected automatically.

3 All 24/30 B-channels are disabled.

4 After a pause of 2.5 seconds, the PRI sends a remote-alarm indication to the far end switch.

5 The appropriate DTA message is printed and a minor alarm is raised on all attendant consoles within the same customer group.

Meridian 1 software checks every 0-15 minutes (programmable) to see if a clock-controller or reference-clock error has occurred.

If the 0-15 minute check finds the PRI in local alarm was a primary clock source, the software switches the clock controller to the secondary reference.

Channel restoration

When the alarm condition improves, the PRI is restored to service as follows:

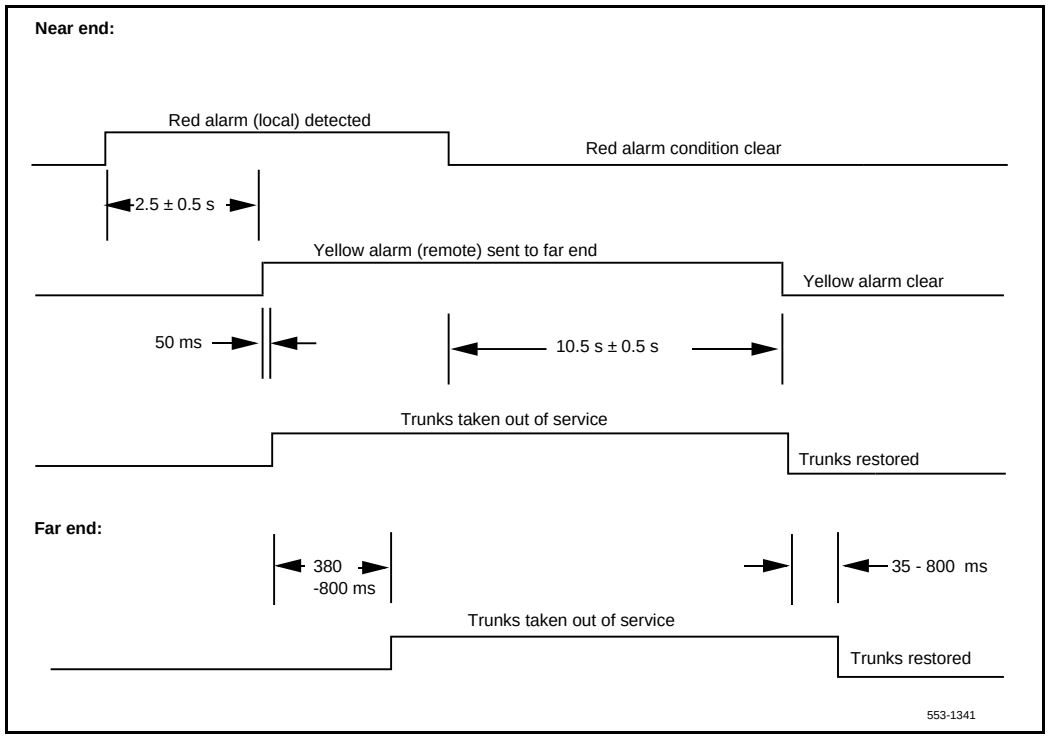
1 The local alarm is cleared.

2 After 11 seconds, the PRI stops sending a remote alarm indication to the far end.

3 The D-channel automatically attempts to re-establish. If this is successful, the B-channels are placed into the idle state and made available for calls.

Figure 1 shows the progression of the Meridian 1 system red and yellow (local and remote) alarm timers.

Figure 1
PRI alarm timers



Procedure 1
Red alarm status check

1 Check PRI status using the following prompts:

LD 60
STAT (loop)

2 Check PRI alarm counters using the following prompts:

LD 60
LCNT (loop)

3 See Table 1 for solutions to possible PRI problems.

PRI yellow alarm (remote alarm)

A remote alarm on the Meridian 1 indicates the far end is out of service. The fact that the PRI is receiving the remote-alarm pattern indicates that there is transmission integrity, but the far end is not ready.

When the PRI receives the remote-alarm signal from the far end, all 24/30 B-channels are disabled.

Channel restoration

When the PRI stops receiving the remote alarm, the channels are placed into the idle state.

Each time a yellow alarm is generated, a counter is incremented. When the yellow alarm 24-hour threshold (prompt RALM in LD 73) is reached, the PRI must be restored to service manually.

Procedure 2
Yellow alarm status check

1 Perform a PRI status check.

2 Contact personnel at the far end to determine what action they are taking.

When the yellow alarm (remote alarm) 24-hour threshold is reached (DTA006 is printed) do the following:

1 Contact personnel at the far end to determine what action they are taking.

2 When the far end troubles are cleared, reset the alarm counters and disable, then enable, the PRI. To do this, use the following commands:

LD 60

LCNT loop	list alarm counters
RCNT loop	reset alarm counters
DISL loop	disable loop
ENLL loop	enable loop

PRI problems

The PRI can have any of the following problems. Determine the cause of the problem and follow the recommended actions provided in Table 1.

Table 1
PRI problem solving (Part 1 of 2)

Symptom	Action
No connection to far end. (If the 1.5 Mb/2Mb transmission cable is not physically connected to the far end, frame-alignment errors occur. The channels will be disabled, but the PRI will be in local-alarm mode.)	Use the Error Counter to verify the 1.5 Mb/2.0 Mb digital transmission directly from the PRI faceplate (RCV and XMT) to each connection (cross-connect, repeater, and other such equipment).
PRI fails self-test.	Replace the PRI card.
Far-end problems, usually indicated by a remote alarm.	Do a PRI status check and contact personnel at the far end for resolution.
PRI is connected but getting bit-rate or frame errors. This can be caused by: • a bad 1.5 Mb/2Mb transmission cable connection • electrical or electromagnetic interference • carrier problems (for example, defective repeater)	Use the Error Counter to verify the 1.5 Mb/2Mb digital transmission from the PRI faceplate (RCV and XMT) to each connection (cross-connect, repeater, and other such equipment).
Configuration settings do not match the far end. These problems can occur during initial start-up. They may be indicated by: • DTA 018Frame-slip out-of-service limit • DTA 021Loss-of-frame-alignment for 3 seconds • DCH 1003D-channel MDL errors	See that the Meridian 1 PRI parameters correlate to the far-end parameters.

Table 1
PRI problem solving (Part 2 of 2)

Symptom	Action
Cannot enable the PRI. Two reasons follow: The far end PRI is disabled, indicated by: • PRI 000PRI is responding • DTA 005remote alarm occurred • DCH 1010DCHI is software disabled	Contact personnel at the far-end site to resolve the problem.
Or, there is no 1.5 Mb/2Mb connection, indicated by: • PRI 000 PRI is responding • DTA 021 loss of frame alignment for 3 • seconds • DCH 1010 DCHI is software disabled	See above, under **No connection to far end**.
Meridian 1 initializes and there are no active B-channels.	When a PRI or ISL trunk interfaces with another Meridian 1 and the Meridian 1 initializes, you may have to disable and then re-enable each B-channel.

D-channel problems

D-channel problems are indicated when the DCHI releases after being enabled. This applies to both primary and backup D-channels. For example:

Command	Response	Meaning
LD 96 ENL DCH N		
	DCH 1003	MDL error
	DCH 1006	link establishment error
	DCH RLS	DCHI released

If these messages appear, refer to Procedure 3 below.

Procedure 3
D-channel status check

Step	Action	Response
1	Check the status of the D-channel's PRI.	
2	Clear any PRI problems.	
3	Contact the far end.	If the far-end D-channel is down, the DCH1006 message is printed.
4	Test the DCHI using tests 100, 101, 200 and 201 (the tests must be run in sequential order).	
5	Print the protocol log using: **LD 96** **PLOG DCH N**	
6	Check the DCHI to PRI cable.	
7	Check DCHI card jumper settings.	
8	Check to see that one Meridian 1 system is designated as "master" (usually the larger system), the other as "slave."	

Quick reference to PRI operations

Contents

The following are the topics in this section:

This chapter provides a quick-reference source for PRI maintenance operations.

PRI commands (LD 60)

Table 2 is a quick reference list of important PRI commands. For a more extensive list of PRI commands, see the section describing PRI maintenance.

Table 2
PRI commands (quick reference) (Part 1 of 2)

Command	Action
ATLP (0), 1	Disable (default) or enable midnight auto loop test
CDSP	Clear maintenance display to 00 or blank
CMIN ALL	Clear minor alarm indication on all attendant consoles
CMIN c	Clear minor alarm indication on attendant consoles for customer c
DISI loop	Disable loop when all channels are idle
DISL loop	Disable network and DTI/PRI cards of loop
DLBK loop	Disable remote loop back test per RLBK command
DLBK l ch	Disable remote loop back test per RLBK l ch command
DSCH l ch	Disable channel ch of loop
ENCH loop	Enable all channels on DTI/PRI
ENCH l ch	Enable channel ch of DTI/PRI loop
ENLL loop	Enable network and DTI/PRI cards of loop
LCNT (loop)	List contents of alarm counters on one or all DTI/PRI loops
LOVF c r	List threshold overflows for customer c (0-99) and route r (0-511)
RCNT	Reset alarm counters of all DTI/PRI loops
RCNT loop	Reset alarm counter of DTI/PRI loop

Table 2
PRI commands (quick reference) (Part 2 of 2)

RMST loop	Perform self-test on loop
RMST l ch	Perform self-test on specified channel (2.0 Mb/s DTI/PRI only)
RLBK loop	Close loop at carrier interface point for testing
RLBK l ch	Close channel ch at carrier interface point
RSET l ch	Reset thresholds for channel ch
SLFT loop	Invoke hardware self-test on loop
SLFT l ch	Invoke partial hardware self-test on channel ch
STAT	Get status of all loops
STAT loop	Get status of DTI/PRI loop
STAT l ch	Get status of channel ch

PRI messages

Refer to *System Messages* (553-3001-411) for commonly encountered PRI messages.

DCHI quick reference

The D-channel Interface (DCHI) card provides an asynchronous port and the DCHI port. The D-channel performs the call set-up and call modification signaling for one or more 30-channel PRI cards. (Switch settings for the DCHI port are shown in the DCHI replacement section.)

D-channel commands (LD 96)

Table 3 is a partial list of DCHI and D-channel commands. For a complete list of DCHI and D-channel commands, see the *Maintenance* (553-3001-511).

Table 3
DCHI and D-channel commands (quick reference) (Part 1 of 3)

Command	Action
DIS AUTO x	Disable automatic recovery for DCH x
DIS DCH x	Disable DCH x
DIS MSGI x (options)	Disable the monitoring of incoming messages on D-channel x
DIS MSGI x FEAT CPNW	Disable incoming monitoring for the Network CPNW ISDN messages on D Channel x.
DIS MSGO x (options)	Disable the monitoring of outgoing messages on D-channel x
DIS MSGO x FEAT CPNW	Disable outgoing monitoring for the Network CPNW ISDN messages on D Channel x.
DIS SERV x	Disable service messages on D-channel x
DLIF DCH x	Force download of D channel x (For PRI UIPE application)
ENL AUTO x	Enable automatic recovery for DCH x
ENL DCH x (FDL)	Enable DCH x and attempt to establish the link, and force download to MSDL
ENL MSGI x (options)	Enable the monitoring of incoming messages on D-channel x
ENL MSGI x FEAT CPNW	Enable incoming monitoring for the Network CPNW ISDN messages on D Channel x.
ENL MSGO x (options)	Enable the monitoring of outgoing messages on D-channel x
ENL MSGO x FEAT CPNW	Enable outgoing monitoring for the Network CPNW ISDN messages on D Channel x.

Table 3
DCHI and D-channel commands (quick reference) (Part 2 of 3)

ENL SERV x	Enable service messages on D-channel x
EST DCH x	Establish multiple frame operation on D-channel x
EST ISPC l ch (N)	Start the data interface establishment process at the ISPC slave side an ISPC link (where “N” = the “number of tries” counter)
FDIS NCAL <DCH#> <conn_ID>	Force disconnect the specified call-independent connection
PLOG DCH x	Print protocol error log on DCH x
RLS DCH x	Release D-channel x
RLS ISPC l ch	Stop the data interface establishment process
RST DCH x	Reset D-channel x, inhibit signaling
RST MON	Reset or reactivate monitoring on D-channels with enabled monitors
SDCH DCH x	Switch to the standby D-channel x
SET MSGI x MON (0)-2	Set monitor output format level for incoming messages on D-channel x
SET MSGO x MON (0)-2	Set monitor output format level for outgoing messages on D-channel x

Table 3
DCHI and D-channel commands (quick reference) (Part 3 of 3)

STAT DCH (x)	Get status of one or all D-channels
STAT ISPC l ch	Get status of data interface establishment process at ISPC slave side ISPC link which has been configured to convey D-channel signaling
STAT NCAL <DCH#>	List all current call-independent connections on a given PRI D-channel.
STAT NCAL <DCH#> <conn_ID>	List information pertaining to a specific call-independent connection
STAT MON (x)	Display the incoming and outgoing monitoring status of one or all D-channels.
STAT SERV (x)	Get the enable/disable status of services messages for one or all D-channels
TEST 100 x	Perform interrupt generation test on DCH x
TEST 101 x	Perform loop back mode test on DCH x
TEST 200 x	Perform interrupt handler test on DCH x
TEST 201 x	Test interrupt handler-to-link interface path

DCH messages

Refer to *System Messages* (553-3001-411) for commonly encountered DCH messages.

MSDL commands

This is a partial list of MSDL D-channel commands. For a complete list of D-channel commands, see the *Maintenance* (553-3001-511).

Table 4
MSDL D-channel commands

Command	Action
DIS LLB x	Disable local loopback mode on MSDL DCH x
DIS RLB x	Disable remote loopback mode on MSDL DCH x
DIS TEST x	Disable TEST mode on MSDL DCH x
ENL LLB x	Enable local loopback mode on MSDL DCH x
ENL RLB x	Enable remote loopback mode on MSDL DCH x
ENL TEST x	Enable TEST mode on MSDL DCH x
PCON DCH x	Print configuration parameters on MSDL DCH x
PTRF DCH x	Print traffic report on MSDL DCH x
TEST LLB x	Start local loopback test on MSDL DCH x
TEST RLB x	Start remote loopback test on MSDL DCH x
ENBL MSDL x	Enable MSDL device number x

Maintenance service messages

Service messages provide near and far end switch status. Both service and service acknowledge messages are supported on PRI B-channels and ISL channels. In addition, service and service acknowledge messages for D-channels are supported between Meridian 1 and Meridian 1 only. These messages are used for backup D-channel and D-channel sanity polling. The status may be in-service and out-of-service.

Service and service acknowledge messages for B-channels and ISL channels are supported between Meridian 1 to Meridian 1.

Service and service acknowledge messages for B-channels and PRI only are supported between Meridian 1 and Meridian 1, and between Meridian 1 and supported Central Office connectivities. The following are the three channel statuses reported by the service and service acknowledge messages for B-channels and ISL channels:

- in-service
- maintenance
- out-of-service

Near end and far end subcategories are defined for each maintenance status. See Table 5 for possible combinations of near and far end status and the channel capability for each status. When the near end status and far end status do not match, the more severe maintenance status takes effect over the less severe maintenance status.

Table 5
Maintenance message status

Near end status	Far end status	B or ISL channel capability for near end
In-service	In-service	both incoming and outgoing calls allowed
In-service	Maintenance	only incoming calls allowed
In-service	Out-of-service	not allowed to use
Maintenance	n/a	not allowed to use
Out-of-service	n/a	not allowed to use

Service message function

Service messages are used to monitor the following:

- D-channel establishment
- D-channel sanity polling
- B-channel or ISL channel status change
- Channel status audit

D-channel establishment

When the D-channel establishes, the B-channel status is supported by sending service messages for each B-channel controlled by a D-channel. This allows the far end to synchronize its channel states. These service messages are sent when the D-channel is brought up automatically by the system or manually by using LD 96.

This function is supported by Meridian 1 to Meridian 1 connections only.

D-channel sanity polling

If a D-channel has been idle for 30 seconds, a service message is sent to poll the sanity of the link. The service message is sent regardless of whether the near end is configured as a master or a slave.

B-channel or ISL channel status change

Whenever there is a status change for a B-channel or an ISL channel, the new status is reported to the far end by means of a service message. Status change can occur through service change or maintenance operations, such as the addition or deletion of a channel in LD 14 or the enabling or disabling of the associated loop, shelf, card or unit in LD 30, LD 32, LD 36, LD 41, or LD 60.

Channel status audit

LD 30 is enhanced to allow channel status audit to be initiated. The channels associated with each D-channel are examined and their status is reported to the far end by means of service messages.

Service message commands

You activate the service messages in LD 96 on a per D-channel basis. These are the commands:

- ENL SERV x: Turns on the support of service and service acknowledge messages for D-channel x. The primary and backup D-channels must be disabled before enabling service messages.
- DIS SERV x: Turns off the support of service and service acknowledge messages for D-channel x.
- STAT SERV (x): Displays the current service and service acknowledge message SERV setting for individual DCH n or for all D-channels.

Note: The ENL SERV and DIS SERV commands apply to both the primary and backup D-channel. With backup D-channel configured, for example LD 17 DCHI = 5 and LD 17 BCHI = 7, ENL SERV 5 enables both D-channels 5 and 7. Similarly, DIS SERV 5 disables both channels.

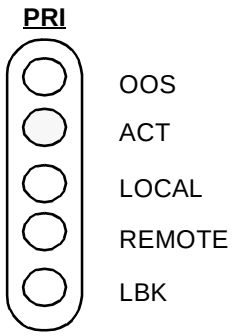
The FE MBSY, FE DSBL, and IDLE messages appear when either the B-channel or the ISL channel is idle. See "PRI fault clearing" on page 9 for more information about these responses.

PRI status check

This status check is used to verify that a PRI is working normally. It assumes the PRI and DCHI are properly installed (for example, correctly cabled) and operational. If the PRI status is not as shown in the steps below, complete the check and proceed to PRI fault clearing procedures.

Once all problems are cleared, go to "PRI start-up" on page 29.

Procedure 4
PRI status check (Part 1 of 3)

Step	Action	Response
1	Check the status LEDs on all PRI cards.	For normal operation, only the green ACT LED is lit.  553-1340
2	Note whether any other LED is lit and continue with the status check.	

Procedure 4
PRI status check (Part 2 of 3)

Step	Action	Response
3	Check the LED on the DCHI faceplate.	If the LED is lit, the D-channel is disabled. ***Note:*** The DCHI LED indicates the status of both ports on the DCHI card. If both ports are configured, the LED is lit only when both ports are disabled.
4	Check the status of the DCHI port using: **LD 96** **STAT DCH x**	
5	Check the status of all PRIs using: **LD 60** **STAT**	Sample response: STAT (L) PRI LOOP L - ENBL REF CLK - DSBL SERVICE RESTORE - YES ALARM STATUS: ACCEPTABLE CH 01 - IDLE TIE * CH 02 - IDLE TIE * CH 03 - IDLE TIE * CH 04 - IDLE TIE * . . CH 31 - D-channel *

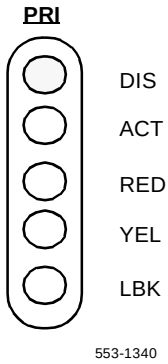
Procedure 4
PRI status check (Part 3 of 3)

Step	Action	Response
6	List PRI alarm counters using: **LD 60** **LCNT (L)** (Check the out of service counters to determine the number of out of service occurrences since the last execution of the midnight routines.)	PRI LOOP L MNT NNDC NNC OOS BVP- xxx xxx xxx xxx FAP- xxx xxx xxx xxx SLP- xxx xxx xxx xxx CRC- xxx xxx xxx xxx G2 xxx xxx xxx xxx TOTAL 24 HOUR BPV- xxxxxxxxx TOTAL 24 HOUR FAP- xxxxxxxxx TOTAL 24 HOUR SLP- xxxxxxxxx TOTAL 24 HOUR CRC- xxxxxxxxx TOTAL 24 HOUR G2 AIS - xxxxxxxxx TOTAL 24 HOUR G2 LFAS - xxxxxxxxx TOTAL 24 HOUR G2 LMAS - xxxxxxxxx TOTAL 24 HOUR G2 RAI - xxxxxxxxx TOTAL 24 HOUR G2 LOS - xxxxxxxxx
7	Check DCHI card and D-channel (DCH) link status using: **LD 96** **STAT DCH (N)** (N is the I/O port number)	the DCHI status should be OPER (operational) and EST (established)
8	Check to assure the following PRI cables are connected correctly: — PRI to DCHI cable — E1/T1 transmission cable from NT8D72AA to DSX (the digital cross connect)	

PRI start-up

This procedure provides the steps required to take the PRI and DCH from a disabled to an operational state.

Procedure 5
PRI status check (Part 1 of 2)

Step	Action	Response	
1	Check the status of all PRI cards.	The PRI shown is disabled.  553-1340	
2	If any other LEDs are lit, go to PRI fault clearing.		
3	Test all PRIs using: **LD 60** **DISL loop** **SLFT L**	SLFT OK	
4	Enable all PRIs using: **LD 60** **ENLL L**	PRI000 DTA005 DTA007 DTA023 DCH1010	Correct version ID remote alarm remote alarm cleared (provided the far end is up) PRI loop is up D-channel is disabled

Procedure 5
PRI status check (Part 2 of 2)

Step	Action	Response
5	Enable the D-channel(s) using: **LD 96** **ENL DCH N** (N is the I/O port number)	DCH EST Time and Date D-channel is established (provided far end D-channel is OK). If you do not get the DCH EST response, see the note at step 6.
6	Perform a PRI status check. ***Note:*** If the status check response is RLS, establish the link at this point by entering the command: **EST DCH N** (N is the I/O port number)	

Network Call Trace

Network Call Trace is available to trace a network call and to diagnose network problems. When a network call is blocked, trace data is output indicating the reason the call was blocked and the X11 software procedure responsible.

A network call can be traced by dialing a SPRE code and the NCT feature code (9912) before the network number. When this is done, call set-up and status information is output to the system terminal as the call tandems through the network. The trace information is output to all the system terminals designated in LD 17 as ADAN = TTY and USER = MTC.

NCT provides useful information such as the following:

- the route used
- the facility accessed
- the routing control imposed
- the call-blocked location

There are two Network Call Trace functions: 01 and 02. They output different information as shown in the following sections.

Enhanced Trace command output

A time stamp is available to the call trace output. This time stamp appears on the first line of the output.

The TN or digital trunk prints out only when there has been a change to the call register. The TN or trunk is printed only once.

Sample time stamp output which will appear on the first line:

```
.14:00:02 12/25/1992
```

Configure Network Call Trace

To configure Network Call Trace on the Meridian 1, log in to the system and do the following:

- enter NCT in response to prompt RCAP in LD 17 for each D-channel
- enter CLTA in response to prompt CLS in LD 10 or LD 11 to allow a telephone to trace calls

Trace a call

A call can be traced from any attendant console or a telephone with CLTA class of service (CLS). To trace a call dial the following:

SPRE + 9912 + xx + yyy...

where

SPRE = special function access code (defined in LD 15)
9912 = NCT feature code
xx = call trace function (01, 02)
Dial tone is provided after “xx” is dialed.
yyy... = digits normally dialed for the network call

Trace function 01

This function provides the common information related to ESN routing. It is the recommended function. The following is the call trace data for function 01:

**** NCT xx ****
<switch specific data>
--- OUT ---
<outgoing data>
--- IN ---
<incoming data>
--- STATE ---
<call state>

Where xx is the call trace ID for a traced call. The output data depends on the type of call and can be the following:

CAUSE xxxx—call reject cause
CREF xxxx—call reference number
DCH—D-channel number
DGT xxxxx...—outgoing: digits outpulsed
DGT xxxxx...—state: digits received (NODE=TBD), or digits dialed when the call is rejected (STAT=REJ)
DN xxx—DN of ringing set
ENT xx—entry in the outgoing route list
FCI x—free calling area index
FRL x—facility restriction level

IFC xxx—outgoing D-channel interface (LD 17 prompt IFC)
- D100 = Meridian DMS-100
- D250 = Meridian DMS-250
- ESS4 = AT&T ESS4
- ESS5 = AT&T ESS5
- SL1 = Meridian SL-1
- S100 = Meridian SL-100
- SS12 = Norwegian SYS-12
- AXEA = AXE-10 (Australia)
- UNKN = unknown data received

LOC xxxx—call reject software location
MODE xxx—outgoing termination
- ALOG = analog trunk

DTI = digital trunk interface–1.5 Mb/s
DTI = digital trunk interface–2.0 Mb/s
ISL = ISDN Signaling Link
PRI = Primary Rate Interface
UNKN = unknown data received

NCOS xx—Network class of service
NODE xxxx—type of node
ORIG = originating node
TAND = intermediate node (tandem)
TERM = terminating node
TBD = node undetermined
RLI xxx—ESN outgoing route list index
RLS xx xx—software release, issue number of node switch
RTE xxx—incoming or outgoing route number
SID xxxx—system identification (LD 17)
STAT xxxx—call state, where xxxx can be
ANS = call answered
BUSY = termination busy
DIAL = call state is dialing (mainpm)
ERR = error detected in this message
OPULSE = digit outpulsing
PROC = call proceeding through this node (tandem)
REJ = call rejected or blocked
REOR = call state is dialing (mainpm)
RING = call ringing
SEIZ = trunk seized

STYP xx—terminating station type
500 = single line telephone (LD 10)
BCS = multi-line telephone (LD 11)
ATT = attendant console (LD 12)
TKTP TIE,COT,WAT...—incoming or outgoing trunk type
TKTN loop ch, l s c u—incoming or outgoing B-channel, ISL trunk TN
TN l s c u
TN of originating telephone
TOD x—time of day schedule
TYP I,E —Initial/Extended set
XLT NPA,NXX,LOC...—ESN translation type

Example 1: Successful call with trace function 01

In this example, the following digits are dialed from a telephone at TN 0 0 5 1.

1+9912++01+78+6000

where,

1 = SPRE (defined in LD 15)
9912 = NCT feature code
01 = call trace function 01
78 = PRI route access code (ACOD)
6000 = remote extension

The resulting trace information is output on the maintenance terminal:

```
**** NCT # 22 ****
NODE ORIG (SL1)
SID 0
RLS 17 53
--- OUT ---
TNS 0 0 5 1
DCH 5
IFC SL1
CREF 22
MODE PRI
RTE 24
TKTP TIE
TKTN 18 22
DGT 6000
--- STATE ---
 STAT PROC

**** NCT # 22 ****
NODE ORIG (SL1)
SID 0
RLS 17 53
```

--- OUT ---
DCH 5
RTE 24
TKTP TIE
TKTN 18 22
DGT 6000
--- STATE ---
STYP BCS
DN 6000
STAT RING

Example 2: Unsuccessful call with trace function 01

In this example, the same call is made as in example 1, but in this case the D-channel is down.

The resulting trace information is output on the maintenance terminal:

**** NCT # 22 ****
NODE ORIG (SL1)
SID 0
RLS 17 53
--- OUT ---
TNS 0 0 5 1
MODE UNKN
--- STATE ---
DGT 786000
STAT REJ
LOC 99

Trace function 02

Call trace function 02 provides the information from the active (main) call register, the incoming call state, and the outgoing call state (if any). Trace function 02 is intended as a debugging tool for system designers.

The information output by function 02 includes the following:

NODE ORIG,TAND,TERM,TBD
SID xxxx—system identifier
RLS xx xx—release of software, issue number of node
TNS l s c u—TN of the originating set
CREF xxxx—call reference number

Incoming call:

ISTATPM x—incoming state progress mark
ITRKPM x—incoming trunk progress mark
LOC xxxx—call reject software location

Outgoing call:

OSTATPM x—outgoing state progress mark
OTRKPM x—outgoing trunk progress mark
LOC xxxx—call reject software location

Main call register:

Word 0—MainPM/AuxPM
Word 1—CRlink
Word 2—Queue_In
Word 3,4—Son_Types/Processes
Word 5—Aux_CRlink
Word 6—OrigType/TerType
Word 7—TTR_TN
Word 8—OrigTN
Word 9—TerTN
Word 10—CallFwdTN
Word 11—DISA_Call/XFER_indication
Word 12,13—CR_Dialed_DN
Word 14—Digitload/Digitunload
Word 15-20—digits

Feature requirements

Network Call Trace is limited to basic ISDN PRI/ISL calls across Meridian 1 private networks.

NCT collects information only during initial call setup. It does not report on further call modification, such as Call Transfer.

Network call information is lost and the call trace ceases when any of the Meridian 1 nodes in which the call is being traced is initialized or any of the D-channels fails.

Although NCT requires PRI or ISL, calls can be traced to nodes that do not support Network Call Trace. Calls can also be traced to DTI or analog trunks. However, only the local node information is provided. These are the trunk types that are not supported: ADM, AWU, DIC, MDM, MUS, PAG, RAN, RLM, and RLR.

Call trace information is still output if the call is blocked before the trunk is seized. If queuing (Ring Again, CBQ or OHQ) is available, then the original call trace function is activated when the call is offered to the user.

When a remote Meridian 1 without NCT capability receives a Call Trace message, no call trace information is returned.

Primary Rate Interface maintenance

Contents

The following are the topics in this section:

PRI commands (LD 60)

Primary Rate Interface (PRI) diagnostic commands are used to maintain both PRI and clock-controller operation. See Table 6 for a list of the PRI card and channel commands in Overlay 60. The commands are organized as follows:

- PRI card and channel commands
- Alarm and counter commands
- Test commands

Table 6
PRI card and channel commands in Overlay 60 (Part 1 of 3)

Command	Description
DISI L	PRI loop L is disabled only when all the channels are idle. The network and PRI cards are then disabled and status LEDs are lit. **Channel status is set to busy.** Enter END to abort.
DISL L	Disables network and PRI circuit packs of loop L. Active calls are automatically disconnected by on-hook simulation. **All channels are disabled** and status LEDs are lit.
DSCH L CH	All channels of loop L are disabled.
ENCH L CH	All channels of loop L are enabled.
ENLL L	Enables PRI loop L. Channel CH of PRI loop L is enabled. The channel is placed into the idle state and made available for calls.
STAT	Prints the status of all digital loops.

Table 6
PRI card and channel commands in Overlay 60 (Part 2 of 3)

Command	Description
STAT loop	Get status of digital loop. Sample output: AAA TRK LOOP x - BBBB SERVICE RESTORE: YES/NO YEL ALM PROCESS: YES/NO ALARM STATUS: NO ALARM/RED(local) ALARM Where: AAA may be: DTI DTI2 PRI PRI TIE DID DTI LINK (DTI link loop = DLI) Where: BBBB may be: DSBL = Hardware of specified digital loop is disabled ENBL = Hardware of specified digital loop is enabled RLBK = Hardware of specified digital loop is in remote loop back mode DISI PENDING = DSI command is in progress TRACKING = system clock is tracked to this loop IDLE = Hardware of specified digital loop is idle When AAA = TIE, IDLE ISPC indicates that the channel is an established ISPC link ready to be used by any end-users having access to the associated ISPC route. SERVER RCVY = server has not recovered status of DTI LINK loop. Channels will not be allocated for call processing until this status is removed by the server BUSY = Hardware of specified digital loop is busy

Table 6
PRI card and channel commands in Overlay 60 (Part 3 of 3)

Command	Description
	When AAA = TIE, BUSY ISPC indicates that the channel is an established ISPC link which is used by end users on the PBXs. When AAA = DID, BUSY ISPC indicates that the ISPC link is established to the Central Office. The status “BUSY” is independent to ISL feature usage of the ISPC link. MBSY = Hardware of specified digital loop is in make busy mode When AAA = TIE, MBSY ISPC indicates that the configured ISPC link is one of the following: **a** not established yet **b** established, but the ISL D-channel which controls its usage not established Where: SERVICE RESTORE may be: YES = restore service automatically if alarm is removed NO = loop can only be manually enabled Where: YEL ALARM PROCESS may be: YES = yellow alarm processing is enabled NO = yellow alarm processing is disabled Where: ALARM STATUS may be: NO ALARM = no alarm active RED = red (local) alarm active

PRI alarm commands

See Table 7 for a list of PRI alarm commands and descriptions of these commands. These commands appear in Overlay 60.

Table 7
PRI alarm commands in Overlay 60 (Part 1 of 2)

Command	Description
CDSP	Clears the maintenance display on active CPU to 00 or blank.
CMIN C	Clears the minor alarm indicator for customer C.
CMIN ALL	Clears the minor alarm indicators for all customers.
LCNT	Prints content of all alarm counters of all PRI loops.
LCNT L	Prints content of all alarm counters of PRI loop L. The counters are: BPVBipolar violation bit error rate counter. Indicates the number of times the loop has entered state due to excessive bipolar violations. FAPNumber of times the loop has entered state due to excessive frame bit errors. SLPFrame slip repetition counter. The number of times the loop has entered state due to excessive frame slips. CRCCyclic Redundancy Check (CRC) bit error rate counter. The number of times the loop has entered state due to CRC frame errors. G2The number of times the loop has entered state due to excessive group 2 errors.

Table 7
PRI alarm commands in Overlay 60 (Part 2 of 2)

Command	Description
	TOTAL 24 HOUR BPV24-hour bit error rate count
	TOTAL 24 HOUR FAP24-hour frame bit error rate count
	TOTAL 24 HOUR SLP24-hour slip count
	TOTAL 24 HOUR CRC24-hour CRC error count
	TOTAL 24 HOUR G2 AIS24-hour alarm indication signal count
	TOTAL 24 HOUR G2 LFAS24-hour loss of frame alignment count
	TOTAL 24 HOUR G2 LMAS24-hour loss of multiframe alignment count
	TOTAL 24 HOUR G2 RAI24-hour remote alarm indication count
	TOTAL 24 HOUR G2 LOS24-hour loss of signal count
RSET L CH	Resets the thresholds for PRI loop L, trunk channel CH.
RCNT	Resets all alarm counters of all PRI loops.
RCNT L	Resets all alarm counters of PRI loop L.

PRI test commands

See Table 8 for a list of the PRI test commands and a corresponding description of these commands. The PRI test commands are in Overlay 60.

Table 8
PRI test commands in Overlay 60

Command	Description
ATLP (0) 1	Automatic loop test enable (= 1) or disable (= 0) default. 1 = Loop test enable; this will cause far end to raise and clear remote alarm. 0 = Run the partial loop test; there is no interaction for the far-end loop (default value).
SLFT L	Invokes PRI self-test on loop L. The loop must be disabled because the test disrupts call processing.
SLFT L CH	Invokes partial PRI hardware self-test using channel CH of loop L.
RLBK L	Closes the loop at the carrier interface point of the PRI so the far end can perform an external loop-back test. PRI loop L must be disabled because the test disrupts call processing.
DLBK L	Disables the remote loop-back test per RLBK L. The loop remains disabled.
DLBK L CH	Disables the remote loop-back test per RLBK L CH. The channel remains disabled.
RLBK L CH	Per RLBK L, but performed on channel CH. This channel must be disabled prior to issuing the request.
RMST L	Performs self-test on loop L, providing the far end is in the remote loop-back mode.
RMST L CH	Performs self-test on channel CH, providing the far end is in the remote loop-back mode.

PRI tests

PRI self-test

The self-test checks speech-path continuity, zero-code suppression, and remote-alarm detection. This test is performed manually on a per-channel or a per-frame basis.

The DCHI and PRI must be disabled before performing the self-test or call processing will be disrupted. To perform the self-test on a specific loop, follow Procedure 6.

Procedure 6
PRI self-test

Step	Action
1	Disable the DCHI using: **LD 96** **DIS DCH N**
2	Disable the PRI loop and run the self-test using: **LD 60** **DISL L** **SLFT L**

PRI automatic loop test

The automatic loop test checks the same functions as the self-test. Unlike the self-test, it can be run automatically, as part of the midnight routines.

With the ATLP command set to one:

Procedure 7
PRI automatic loop test

Step	Action
1	If all 30 channels are idle at midnight, SL-1 software disables the card and performs a self-test on all channels.
2	If any of the 30 channels are busy at midnight, software disables one idle channel, chosen at random, and checks it while the card is enabled.

With the ATLP command set to zero, only one channel is tested. The channel tested is randomly selected by software; it cannot be specified.

To perform the remote loop-back test, use:

LD 60

ATLP 1 or **0**

PRI midnight routines

The following PRI maintenance routines should be included in midnight routines:

- Overlay 45: Background signaling and switching diagnostic
- Overlay 95: Automatic trunk maintenance diagnostic
- Overlay 48: Link diagnostic

Link diagnostic and remote loop-back tests

The remote loop-back test and the link-diagnostic test are performed manually on a per-channel or a per-frame (30 channels) basis.

Link diagnostic test

The link-diagnostic test, also called the far-end loop-back test, does not test the SL-1 PRI. It puts the PRI in loop-back mode so a remote loop-back test can be performed on equipment at the far end.

The PRI channel or frame being tested must be disabled.

Remote loop-back test

The remote loop-back test, also called the near-end loop-back test, checks the integrity of the PRI from the SL-1 to the far end. The far end must be in loop-back mode before this test can be performed.

The PRI channel or frame tested must be disabled.

Coordinating the tests

When a technician at the far end asks for loop-back mode on the SL-1:

Disable the DCHI using:

LD 96

DIS DCH N

Disable the PRI loop and activate loop-back mode using:

LD 60

DISL L

RLBK L

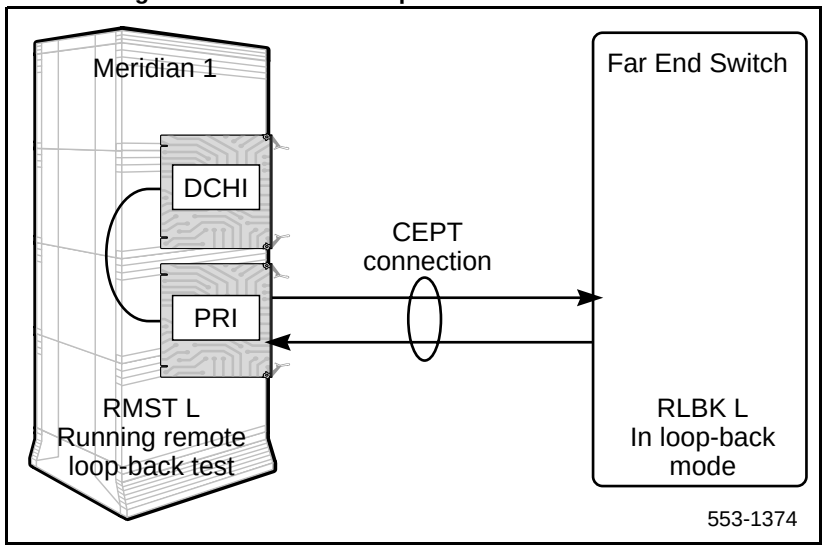
To run the remote loop-back test on the SL-1, follow Procedure 8.

Procedure 8
Remote loop-back test

Step	Action
1	Call a technician at the far end.
2	Ask for loop-back mode at that facility.
3	When loop-back mode at the far end is confirmed: Disable the DCHI using: **LD 96** **DIS DCH N** Disable the PRI loop and run loop-back test using: **LD 60** **DISL L** **RMST L**

Figure 2 shows the relationship between the remote loop-back test and the link diagnostic test.

Figure 2
PRI link diagnostic and remote loop-back tests



PRI error detection

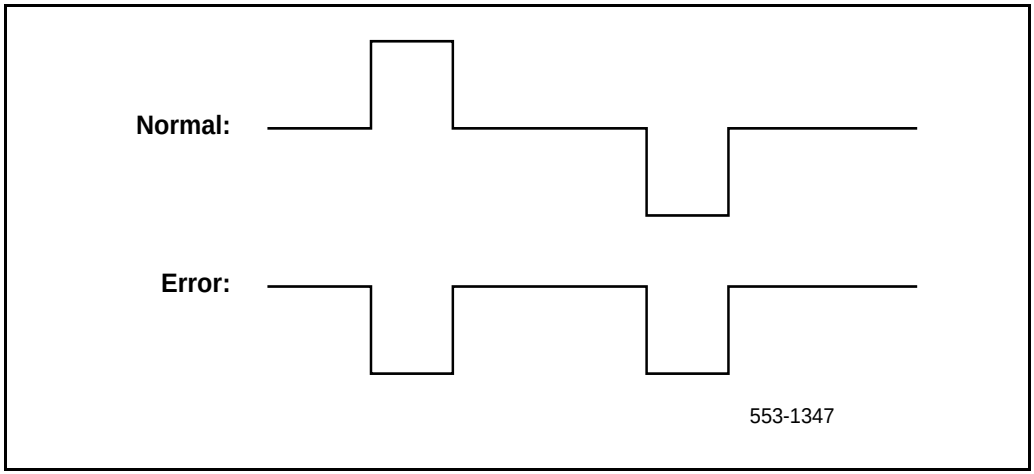
Bit error rate

Bit-error-rate monitoring detects errors in transmission. See Figure 3.

Bipolar violation (BPV) tracking

In a bipolar pulse stream, pulses alternate in polarity. A bipolar violation has occurred if, after transmission, two pulses of the same polarity are received in succession (this could be caused by an electrical disturbance such as noise).

Figure 3
Bipolar violations



Cyclic redundancy check (CRC)

The Extended Superframe Format (ESF) contains a checksum of all the data in the frame. The receiving side uses the checksum to verify the data.

The primary difference between BPV and CRC is that bipolar violation tracking indicates errors on the local span, while CRC indicates errors on an end-to-end span. For example, on a satellite link, BPV only detects errors in the span between the Meridian 1 and the satellite connection. Since CRC traverses the entire span, it indicates an end-to-end bit error rate.

The CRC error counter is displayed with the LCNT L command in LD 60 provided that loop L has been defined with ESF as a framing format. The framing format (D2, D3, D4, or ESF) is selected in LD 17 when the loop is configured.

Bit error rate thresholds

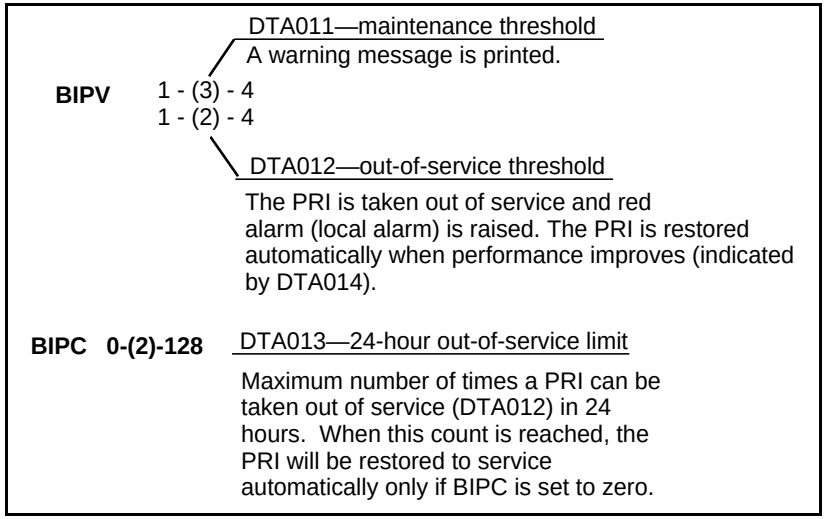
There are three bit error rate thresholds set in LD 73. When a threshold is reached, a DTA message is output. See Figure 4.

DTA011: Bit error rate maintenance threshold.

DTA012: Bit error rate out-of-service limit.

DTA013: Too many bit error rate out-of-service occurrences in 24 hours.

Figure 4
BIPV and BIPC thresholds



The BIPV thresholds are based on the number of errors in a given time. The threshold levels are shown in Table 9.

For example, if the default BIPV thresholds are used, DTA011 is output when the number of errors exceed 15.4 per second. DTA012 is output when the number of errors exceed 154 per second.

When the error rate improves two levels, the PRI is restored to service unless the 24-hour out-of-service counter was exceeded.

Table 9
BIPV thresholds

Level	Error rate	Elapsed time (seconds)	Number of BPV allowed during elapsed time
least tolerant			
1	>10-3 (1544 BPV per s)	0.6639	1025
2	>10-4 (154 BPV per s)	6.639	1025
3	>10-5 (15.4 BPV per s)	66.39	1025
4	>10-6 (1.54 BPV per s)	663.9	1025
most tolerant			

Frame slip

Digital signals must have accurate clock synchronization for data to be interleaved into or extracted from the appropriate timeslot during multiplexing and demultiplexing operations. Frame slip monitoring detects frame deletion and repetition errors in clock synchronization. See Figure 5.

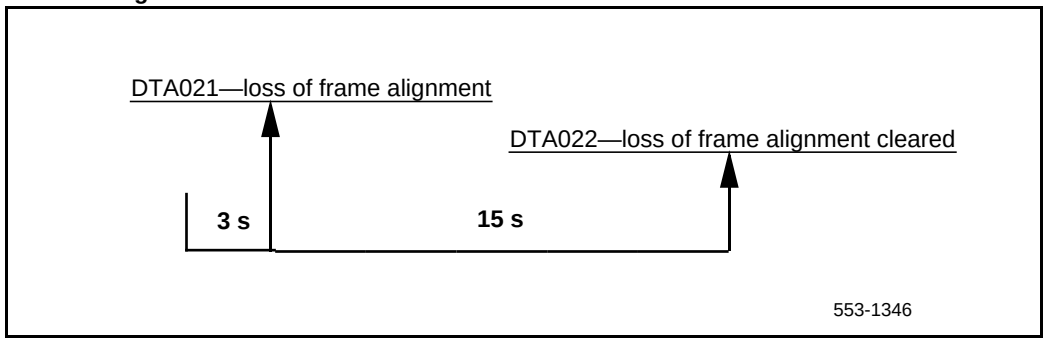
Clock synchronization can be either tracking, on the primary or secondary reference clock, or free run (non-tracking). In LD 73 (prompts PREF and SREF), one PRI may be defined as the primary clock reference. Another may be defined as the secondary clock reference. All others are defined as free run.

PRI hardware detects frame slips in tracking and free run modes. For tracking mode, running the midnight routines prints the number of overflows and clears the counter. For free run mode, running the midnight routines prints the number of frame deletions and repetitions and clears the counters.

Tracking mode There are two thresholds set in LD 73. When a threshold is reached, a DTA message is output as shown below.

DTA015: Maintenance limit for frame slips in tracking mode.
DTA016: Out-of-service limit for frame slips in tracking mode.

Figure 5
DTA messages



Free run (non-tracking) mode A maintenance threshold and an out-of-service threshold are set in LD 73. When these thresholds are reached, DTA messages are output. An option in LD 73 can enable automatic recovery after the out-of-service limit has been reached. Related DTA messages are described below. See Figure 6.

DTA017: Maintenance limit for frame slips in free run (non-tracking) mode. The default is 10 slips in 15 seconds.

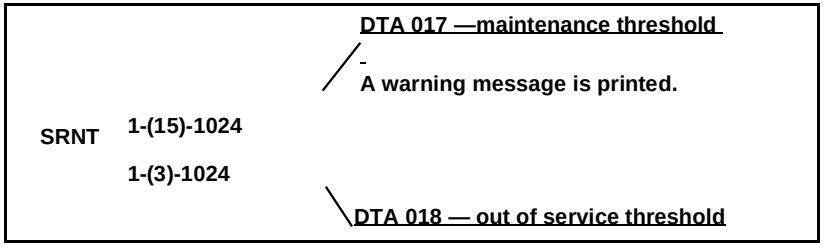
DTA018: Out-of-service limit for frame slips in free run (non-tracking) mode without automatic recovery selected. The default is 10 slips in 3 seconds.

DTA026: Non-tracking frame slip out-of-service threshold reached while monitoring frame slip rate for improvement. Trunks remain out of service. Reset improvement timer.

DTA028: Slip rate improvement criterion is met. Trunks are brought back into service. Reset improvement timer. (Duration of timer selected in LD 73.)

DTA029: Slip rate improvement criteria is met. Trunks being returned to service.

Figure 6
DTA thresholds



Automatic recovery After the tracking mode or non-tracking mode out-of-service thresholds are exceeded, the slip rate is monitored for improvement. When the slip rate has improved, the trunks are returned to service.

There are two parameters set in LD 73:

SRIM	(1) - 127	improvement timer in minutes
SRMM	1 - (2) - 127	improvement criteria

If the non-tracking mode maintenance threshold is exceeded SRMM or fewer timers in the duration of SRIM, then the trunks are returned to service. If not, the timer is restarted and monitoring continues.

Frame slippage is considered less important than alarms for loss of frame alignment persisting for 3 seconds, remote alarm, and bipolar violations exceeding the out-of-service threshold. If any of these alarms are reported while the slip rate is being monitored for improvement, then the monitoring stops. The trunks are returned to service only when the more serious alarms clear.

Frame alignment

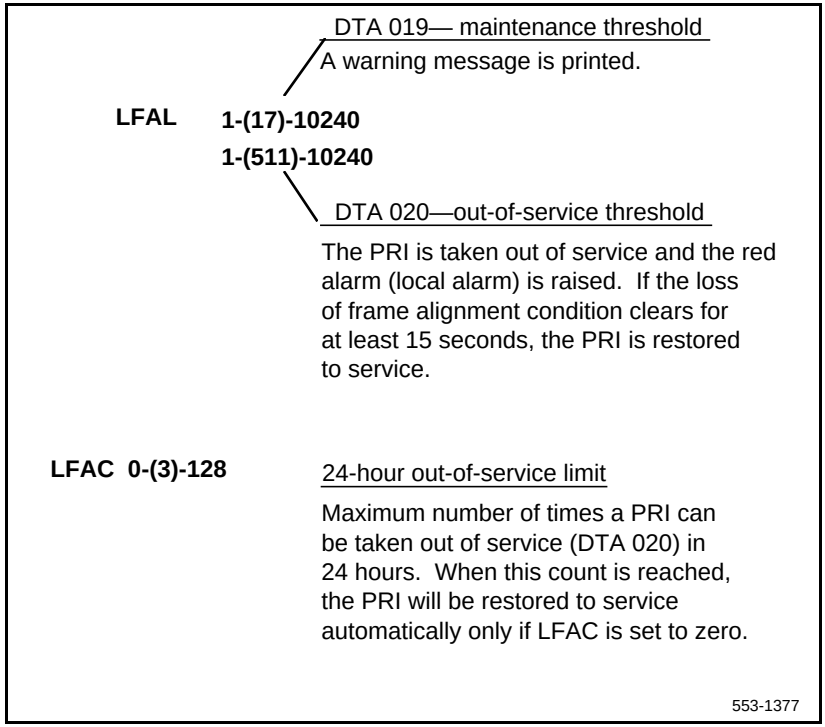
Loss of frame alignment monitoring detects out-of-frame conditions on the DS-1 bit stream. See Figure 7.

Loss of frame alignment thresholds PRI hardware detects out-of-frame conditions. Running the midnight routines prints the number of occurrences when frame alignment was lost and clears the counters.

There are three frame alignment thresholds set in LD 73. When a maintenance or out-of-service threshold is reached, a DTA message is output as shown below:

DTA019:	Frame alignment maintenance limit
DTA020:	Frame alignment out-of-service limit

Figure 7
Frame alignment

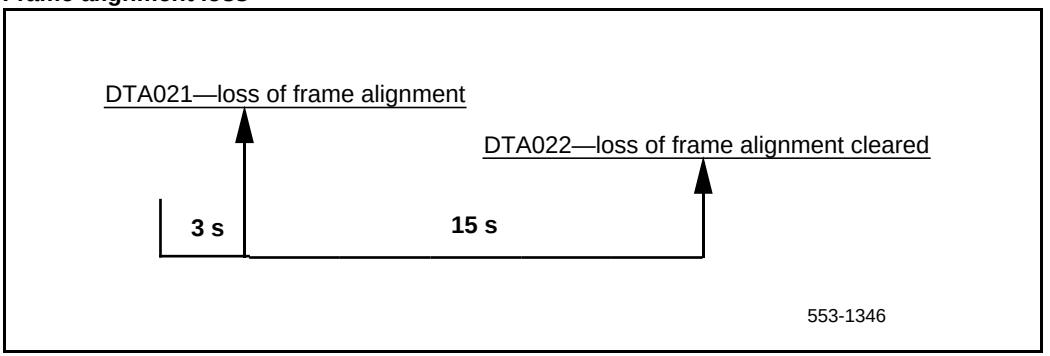


If a loss of frame alignment condition persists for three seconds, the affected PRI loop is taken out of service and a red alarm (local alarm) is raised. See Figure 8.

If the loss of frame alignment condition clears for at least 15 seconds, the PRI is automatically restored to service. The following DTA message is generated:

DTA021: Loss of frame alignment has persisted for 3 seconds.

Figure 8
Frame alignment loss



TN to channel number conversion

PRI channel numbers have an equivalent terminal number (TN). The TN is output instead of the channel number in some Meridian 1 messages. The TN to channel number translation is shown below. Note that the translation is different for the D2 framing format than formats for D3, D4 or ESF.

Terminal numbers are identified in software by Loop (L), Shelf (S), Card (C), and Unit (U) numbers. Each TN is applied to an individual channel on the PRI card. See Table 10 below.

Table 10
PRI channel numbers and equivalent terminal numbers (Part 1 of 2)

Channel number	D2 format TN (S C U)	D3, D4,E SF format TN (S C U)
1	1 4 0	0 1 0
2	1 5 0	0 2 0
3	0 1 0	0 3 0
4	2 1 0	0 4 0
5	0 5 0	0 5 0
6	2 5 0	0 6 0
7	1 1 0	0 7 0
8	1 7 0	1 8 0
9	0 3 0	1 1 0
10	2 3 0	1 2 0
11	0 7 0	1 3 0
12	2 7 0	1 4 0
13	1 3 0	1 5 0
14	1 6 0	1 6 0

Table 10
PRI channel numbers and equivalent terminal numbers (Part 2 of 2)

Channel number	D2 format TN (S C U)	D3, D4,E SF format TN (S C U)
15	0 2 0	1 7 0
16	2 2 0	2 8 0
17	0 6 0	2 1 0
18	2 6 0	2 2 0
19	1 2 0	2 3 0
20	2 8 0	2 4 0
21	0 4 0	2 5 0
22	2 4 0	2 6 0
23	1 8 0	2 7 0
24	3 8 0	3 8 0

Use the error counter

The error counter detects bipolar violations or no-signal periods. It counts, stores, and displays these occurrences to a maximum of 9999.

The PRI fault detection and isolation procedures described in this section are performed using a portable test package, which consists of one each of the following items:

- the TTT2028 Mini-Error Counter, plus operation instruction card
- a cord equipped with a bantam plug at one end and minihooks at the other
- a loopback plug (shorts pins 3 to 1 and 11 to 9 of a 15-pin D connector)

Procedure 9
Using the error counter

> **CAUTION**
> To prevent injury from voltage on the span, always connect the patch cord into the test set before connecting the other end to the external signal source.

1 Plug one end of a patch cord into the input jack of the test set.

2 Plug the other end of the patch cord into one of the monitor jacks (RCV and XMT) of the PRI card being tested.

3 Monitor the error counter LED indicators as described below:

Table 11
Error counter switch functions

Switch	Function
Display Enable	When held down, the switch enables the counter display and the GOOD and O/R LED displays.
Reset	Used to zero the counter.
Error/Error	Used to select error counting seconds for bipolar violations or error-seconds.

Table 12
Error counter display functions

Display	Function
GOOD	Indicates the presence of an acceptable bipolar signal. (If bipolar violations, missing pulses, or an oscillating line are detected, the indicator is off.)
ERR	Flashes when bipolar violations are detected.
W/M	Indicates no input (absence of pulse) or an oscillating line.
O/R	Over range display turns on when the counter input has exceeded 9999 (the counter resets to 0000).
CNTR	With Error/Error-Second switch in the Error position, the unit counts errors at a maximum rate of 200 per second. With Error/Error-Second switch in the Error-Second position, the unit counts error seconds at a rate of one per second.

Replace the PRI

Procedure 10
Replace the PRI circuit card

CAUTION
Firmly touch the metal frame of the cabinet to discharge static electricity from your body before handling circuit cards.

1 Disable the D-channel using the following:
LD 96
DIS DCH x

2 Disable the PRI loop using the following:
LD 60
DISL loop

3 Disconnect cables on PRI faceplate.

4 Remove the PRI card.

5 Make sure that the new PRI card switch settings are the same as the faulty PRI card.

6 Install the new PRI card in the appropriate slot.

7 Connect the network loop cable, the carrier interface cable, and the echo canceller cable. If the PRI card is defined as a primary or secondary clock source, connect the Clock Controller cable(s).

8 Test the PRI card using the following:
LD 60
SLFT loop If an error message results, see PRI fault clearing.

9 Enable the PRI using the following:
LD 60
ENLL loop

End of Procedure

Pulsed E&M DTI2 signaling

Error messages

DTA322 loop channel start-bits pulsed-bits end-bits duration

An invalid pulsed signal has been received from the DTI.

loop = the loop number the signal was received on

channel = the channel number the signal was received on

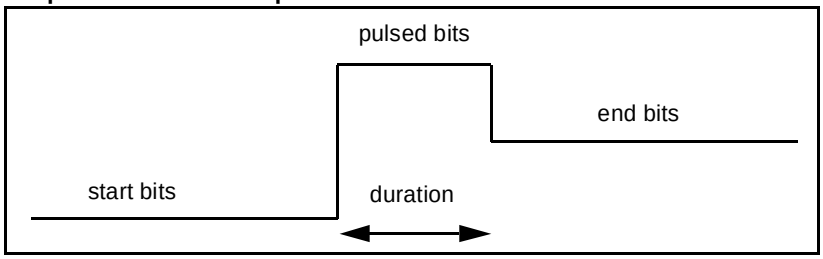
start-bits = the bit pattern before analysis of the pulse

pulsed-bits = the ABCD bit pattern which was possibly part of a pulsed signal

end-bits = the ABCD bit pattern received after the pulse

duration = the length of the pulse in msecs.

Figure 9
Loop channel start-bits pulsed-bits end-bits duration



DTRK500 loop channel

A forward release message has been sent but not acknowledged by a backward release. Check the configuration of the trunk at each end. loop = the loop number of the trunk which sent the forward release channel = the channel number of the trunk which sent the forward release.

DTA205 loop e

The CI-1 firmware has encountered a problem. Refer to DTIOO9 for CI-1 microprocessor error codes (e).

DTA205 loop 128

This error message may result from an attempt to use the software with DTI2 cards prior to QPC915C or QPC536E. New functionality has been introduced in the DTI2 cards. The old cards will ignore attempts to use the functionality introduced in these new cards.

Diagnostics

To print the last sent and received signal, use Overlay 80 - Call Trace. The following print format is used:

```
ACTIVE TN DTI 008 03
ORIG DTI 008 03 DID RMBR 33 1 CALL TYPE VOD
SICA 3
SENT CONN 0101 RECV CONN 0001
PDCA 1 PAD 15 2 PCML A A
TERM 004 0 03 01 0 SCR 0 401 2317
DIAL DN 401
MAIN PM ESTD
TALKSLOT ORIG 15 TERM 15
QUEU NONE
```

The SENT bits indicate the steady state on the line once the pulse is complete. The RECV bits indicate the last bit pattern received on the trunk channel.

D-channel maintenance

Contents

The following are the topics in this section:

DCH commands (LD 96)

Table 13 contains the basic D-channel (DCH) commands in Overlay 96.

Table 13
D-channel commands, Overlay 96 (Part 1 of 2)

Command	Description
DIS AUTO x	Disable automatic recovery for DCH x
DIS DCH x	Disable DCH x
DIS MSGI x (options)	Disable the monitoring of incoming messages on D-channel x
DIS MSGI x FEAT CPNW	Disable incoming monitoring for the Network CPNW ISDN messages on D-channel x.
DIS MSGO x (options)	Disable the monitoring of outgoing messages on D-channel x
DIS MSGO x FEAT CPNW	Disable outgoing monitoring for the Network CPNW ISDN messages on D Channel x.
DIS SERV x	Disable service messages on D-channel x
DLIF DCH x	Force download of D channel x (For PRI UIPE application)
ENL AUTO x	Enable automatic recovery for DCH x
ENL DCH x (FDL)	Enable DCH x and attempt to establish the link, and force download to MSDL
ENL MSGI x (options)	Enable the monitoring of incoming messages on D-channel x
ENL MSGI x FEAT CPNW	Enable incoming monitoring for the Network CPNW ISDN messages on D Channel x.
ENL MSGO x (options)	Enable the monitoring of outgoing messages on D-channel x
ENL MSGO x FEAT CPNW	Enable outgoing monitoring for the Network CPNW ISDN messages on D-channel x.
ENL SERV x	Enable service messages on D-channel x

Table 13
D-channel commands, Overlay 96 (Part 2 of 2)

Command	Description
EST DCH x	Establish multiple frame operation on D-channel x
EST ISPC l ch (N)	Start the data interface establishment process at the ISPC slave side an ISPC link (where “N” = the “number of tries” counter)
FDIS NCAL <DCH#> <conn_ID>	Force disconnect the specified call-independent connection
PLOG DCH x	Print protocol error log on DCH x
RLS DCH x	Release D-channel x
RLS ISPC l ch	Stop the data interface establishment process
RST DCH x	Reset D-channel x, inhibit signaling
RST MON	Reset or reactivate monitoring on D-channels with enabled monitors
SDCH DCH x	Switch to the standby D-channel x
SET MSGI x MON (0)-2	Set monitor output format level for incoming messages on D-channel x
SET MSGO x MON (0)-2	Set monitor output format level for outgoing messages on D-channel x
STAT DCH (x)	Get status of one or all D-channels
STAT ISPC l ch	Get status of data interface establishment process at ISPC slave side ISPC link which has been configured to convey D-channel signaling

DCH tests

There are four types of DCH tests. They are:

- DCH test 100
- DCH test 101

- DCH test 200
- DCH test 201

The DCH tests 100 and 101 are hardware tests, while the 200 and 201 test the DCH software.

DCH tests 100 and 101

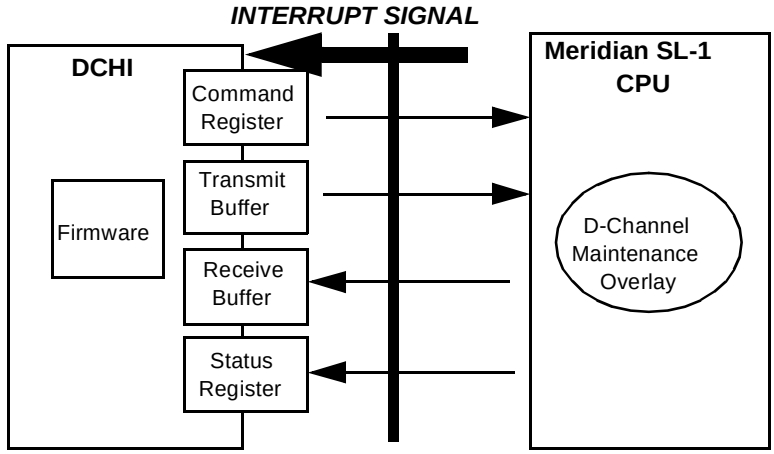
DCH tests 100 and 101 are isolated hardware tests. See Figure 10. Test 100 checks interrupt generation on the DCHI. Test 101 checks the DCHI loop-back capability. If either test fails, either a faulty DCHI or a contention problem is indicated. A test failure will initiate DCH error messages.

Tests 100 and 101 must be run in sequential order (tests 200 and 201 may follow). Established calls will stay up, but new calls cannot be placed

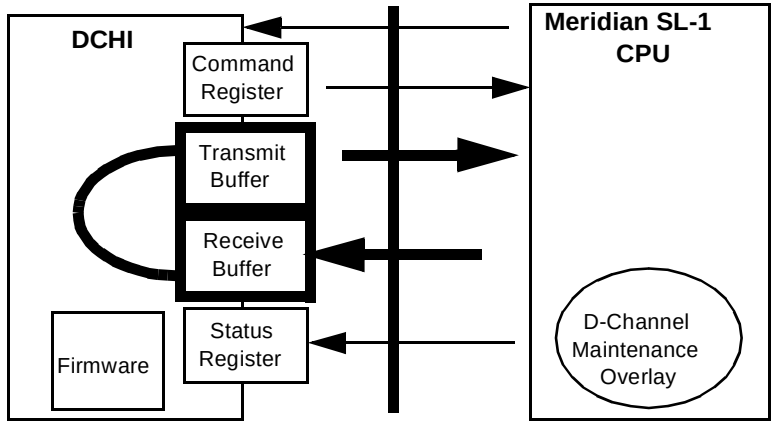
Procedure 11
DCHI hardware test procedure

Step	Action
1	Log in to the overlay system. Then, enter overlay program 96 by entering the command
	LD 96
2	If the DCHI link is disabled, it must be enabled by entering the commands
	STAT DCH N (responds **DSBL**)
	ENL DCH N(if a problem caused the disabled state, RLS will occur; if the disabled state is cleared, status will be EST)
	RST DCH N
3	Place the DCHI link in the reset state (from either the established or Released state) by entering the commands
	STAT DCH N (responds either **EST** or **RLS**)
	RST DCH N
4	Activate the first hardware test by entering the command
	TEST 100 N
5	Activate the second hardware test by entering the command
	TEST 101 N

Figure 10
DCH tests 100 and 101



TEST 100: Interrupt generation



TEST 101: Loop-back mode

553-1381

DCH tests 200 and 201

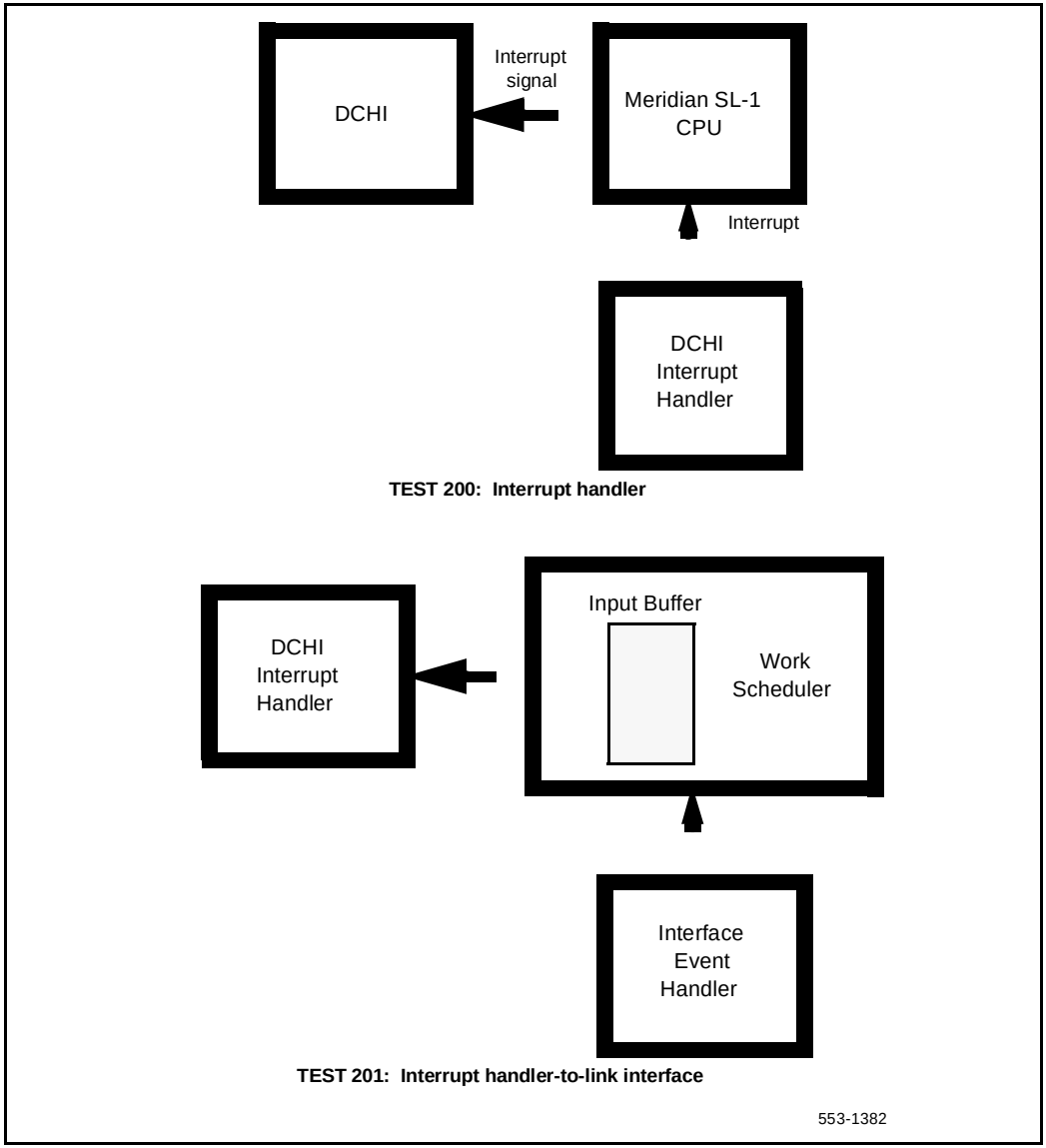
DCH tests 200 and 201 are software tests. See Figure 11. Test 200 monitors the DCHI interrupt handler. Test 201 checks the interrupt handler-to-link interface path. If either test fails, software problems are indicated. A test failure will initiate DCH error messages.

Tests 200 and 201 must be run sequentially after tests 100 and 101. Established calls will stay up, but new calls cannot be placed

Procedure 12
DCHI software test procedure

Step	Action
1	Log in to the overlay system. Then, enter overlay program 96 by entering the command
	LD 96
2	If the DCHI link is disabled, it must be enabled by entering the commands
	STAT DCH N (responds **DSBL**
	ENL DCH N(if a problem caused the disabled state, RLS will occur; if the disabled state is cleared, status will be EST)
	RST DCH N
3	Place the DCHI link in the reset state (from either the established or Released state) by entering the commands
	STAT DCH N (responds either **EST** or **RLS**)
	RST DCH N
4	Activate the first software test by entering the command
	TEST 200 N
5	Activate the second software test by entering the command
	TEST 201 N

Figure 11
DCH tests 200 and 201



DCH traffic (LD 2)

Traffic report TFS009 provides accumulated D-channel statistics. This report can be included in the scheduled traffic report, or printed on demand as described below.

To enable D-channel measurement in the scheduled traffic reports use the Set System Traffic Options (SOPS) command. For example, to enable option 9 for D-channel use:

LD 2

SOPS 9

To print current D-channel measurement use the Invoke System Traffic (INVS) command. For example, to enable option 9 for D-channel use:

LD 2

INVS 9

TFS009 D-channel

TFS009 reports traffic activity for D-channels. Eight fields report activity on the Multi-purpose Serial Data Link (MSDL) D-channel. Nine fields report activity associated with the QSIG Path Replacement feature.

Table 14
TFS009 D-channel report format

System ID DCH x	TFS009	
aaaa		nnnn
bbbb		oooo
cccc		pppp
dddd		qqqq
eeee		rrrr
ffff		ssss
gggg		
hhhh		tttt
iiii		
jjjj		uuuu
yyyy		
kkkk (MSDL only)		vvvv (MSDL only)
llll (MSDL only)		wwww (MSDL only)
mmmm (MSDL only)		xxxx (MSDL only)
tat1 (MSDL only)		tat2 (MSDL only)
DIV_NB	DIV_NEW	DIV_OLD
CNG_NB	CNG_NEW	CNG_OLD
CON_NB	CON_NEW	CON_OLD
FLOW FLOWa	FLOWb	FLOWc FLOWd

Table 15
Legend for TFS0009 report (Part 1 of 3)

SYSTEM		
	aaaa	number of all incoming messages received on the D-channel
	bbbb	number of all incoming call processing messages received on the D-channel
	cccc	number of all incoming management messages received on the D-channel
	dddd	number of all incoming maintenance messages received on the D-channel
	eeee	average number of incoming bytes per message
	ffff	accumulated real time a D-channel was busy transferring incoming messages in half-millisecond units (Divide the reported number by 2 for a result in milliseconds. For example: divide a reported number of 200 by 2 for a result of 100 milliseconds.)
	gggg	running average of the number of requests queued in request output message buffer
	hhhh	number of times when no request output message buffer was available
	iiii	number of PRA layer-3 protocol errors since the last traffic report
	jjjj	number of times the D-channel was down
	yyyy	number of established call-independent connections
	kkkk	average incoming link usage (given as a percentage of the link capacity)
	llll	average outgoing link usage (given as a percentage of the link capacity)
	mmmm	number of connected calls
	tat1	total number of anti-tromboning operations attempted since the D-channel traffic was last cleared
		Number of optimization requests with the diversion trigger

Table 15
Legend for TFS0009 report (Part 2 of 3)

	nnnn	number of all outgoing messages sent on the D-channel
	oooo	number of all outgoing call processing messages sent on the D-channel
	pppp	number of all outgoing management messages sent on the D-channel
	qqqq	number of all outgoing maintenance messages sent on the D-channel
	rrrr	average number of outgoing bytes per message
	ssss	accumulated real time a D-channel was busy transferring outgoing messages in half-millisecond units (Divide the reported number by 2 for a result in milliseconds. For example: divide a reported number of 200 by 2 for a result of 100 milliseconds.)
	tttt	number of times a message with no End of Message (EOM) mark was received
	uuuu	accumulated real time the D-channel was down since the last report in units of 2 seconds. For example, if the value is 10, the down time is 20 seconds
	vvvv	peak incoming link usage (given as a percentage of the link capacity) over a 5-second period
	wwww	peak outgoing link usage (given as a percentage of the link capacity) over a 5-second period
	xxxx	time (in seconds) since the MSDL D-channel traffic was last cleared
	tat2	total number of successful anti-tromboning operations since the D-channel traffic was last cleared
	CNG_NB	Number of optimization requests with the congestion trigger
	CNG_NEW	Number of optimization successful with the congestion trigger: a new path is used
	CNG_OLD	Number of optimization successful with the congestion trigger but the old path has been retained
	CON_NB	Number of optimization requests with the connected trigger

Table 15
Legend for TFS0009 report (Part 3 of 3)

	CON_NEW	Number of optimization successful with the connected number trigger: a new path is used
	CON_OLD	Number of optimization successful with the connected number trigger but the old path has been retained
	DIV_NB	Number of optimization requests with the diversion trigger
	DIV_NEW	Number of optimization successful with the diversion trigger: a new path is used
	DIV_OLD	Number of optimization successful with the diversion trigger but the old path has been retained
FLOW		To prevent any application from tying up buffer resources due to its abnormal conditions or misbehavior, a flow control mechanism is defined in the Meridian 1 and at the card level. This flow control mechanism only applies to the normal interface (receive and transmit ring buffers, not the expedited interface).
		This flow control mechanism is based on a common “window” mechanism. The basic concept is that the number of outstanding messages that are associated with a Socket ID in the transmit or receive ring cannot exceed a predefined number, “application threshold”. Note that the mechanism is based on the number of messages per application rather than the number of buffers per application.
	FLOWa	first flow control hit starts a 128ms timer to allow one more try
	FLOWb	second flow control hit requests the sending of OK_TO_SEDN_REQ message via a logged SSD message to MSDL loadware. Start the 128ms timer
	FLOWc	third flow control hit asks the data socket to be resynchronized by MSDL loadware. Start the 128ms timer
	FLOWd	fourth flow control hit starts a 128ms timer such that the link will be forced to disable after time out.

MSDL local loopback test (NT6D80)

See Figure 12. Before beginning this test, the D-channel must be in test state:

ENL TEST x, where **x** is the logical DCH number.

To start the local loopback test on the Multi-purpose Serial Data Link (MSDL) card, use the **ENL LLB x** command, where **x** is the logical DCH number.

Then perform the following test:

TEST LLB x

The test checks both MSDL expedited and normal (ring) interfaces.

The response for the expedited interface that carries urgent signaling and maintenance messages between the Meridian 1 CPU and the MSDL MPU follows:

DCH : X XDU TEST CONFIRM TIME : <time of day>
TEST : PASS (or FAIL)

X is the DCH logical number
XDU is the expedient message sent around the loop.

The response for the ring interface that transmits operation data between the Meridian 1 CPU and the MSDL MPU follows:

DCH : X DU TEST CONFIRM TIME : <time of day>
TEST : PASS (or FAIL)

1. If the test fails, check the status of the MSDL card, used by this DCH link, with the **STAT MSDL y FULL** command, where **y** is the physical port (DNUM) of the MSDL card.
2. If the MSDL card may be faulty, disable the card and perform a reset self-test.

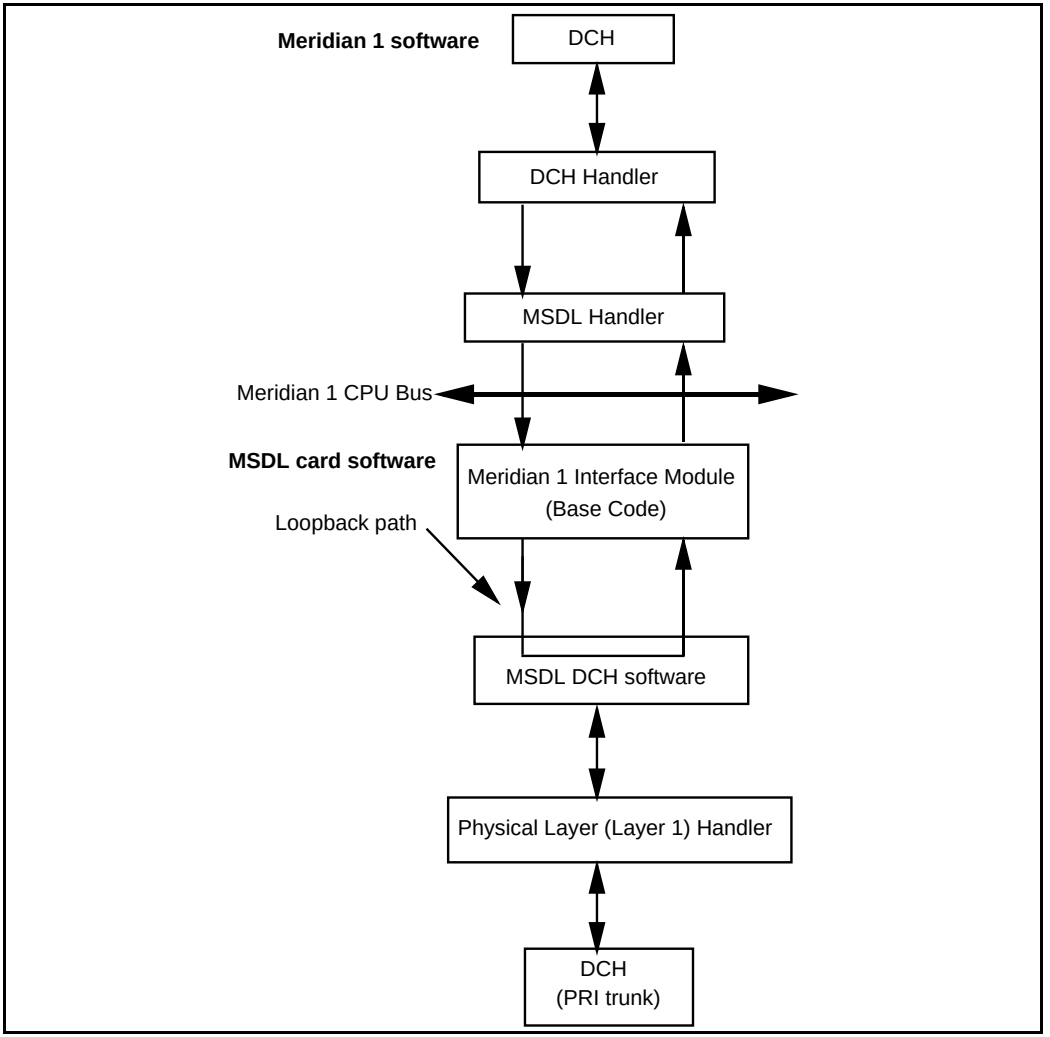
   DIS MSDL y
   RST MSDL y
   SLFT MSDL x
3. If the card passed the test, the problem may lie in incompatible software.

After completing the test, remove the D-channel from the test state:

DIS TEST x.

Refer to *Multi-Purpose Serial Data Link: Description* (553-3001-195).

Figure 12
Local loopback test (NT6D80)



MSDL remote loopback tests (NT6D80)

See Figure 13. Before beginning this test, verify the following:

- D-channels on both switches are configured on MSDL cards
- DCH links on both switches are set to TEST mode
- DCH at Switch B is in remote loopback mode (RLB)
- remote capability (RCAP) is MSDL

1 Place DCH links on both systems in TEST mode. Enter **ENL TEST x** on Switch A and **ENL TEST y** on Switch B for the same DCH link. The DCH links on both switches are automatically placed in idle state (IDLE).

2 Place the Switch B DCH link in remote loopback state (RLB) with ENL RLB DCH x. The DCH link in Switch A must stay in idle.

3 From Switch A, perform the loopback test with TEST RLB DCH x.

The result of the remote loopback test is displayed on Switch A's console in the following format:

DCH : X RLB TEST CONFIRM TIME : <time of day>
TEST : PASS
TEST : FAIL - NO DATA RCV FAR END
TEST : FAIL - CORPT DATA RCV FAR END
TEST : FAIL - REASON UNKNOWN

TEST : FAIL may indicate a problem in the physical link between the two switches, or faulty equipment in either switch. Check the connections, and verify the status of the MSDL and PRI trunk cards used for this link.

4 Place the Switch B DCH link back to the idle state, with the **DIS RLB y** command.

5 If you think the MSDL card used in either switch has failed, check the status of the DCH link and the status of the MSDL card by entering **STAT MSDL x FULL**.

6 If the MSDL card may be faulty, disable the card and perform a self-test:

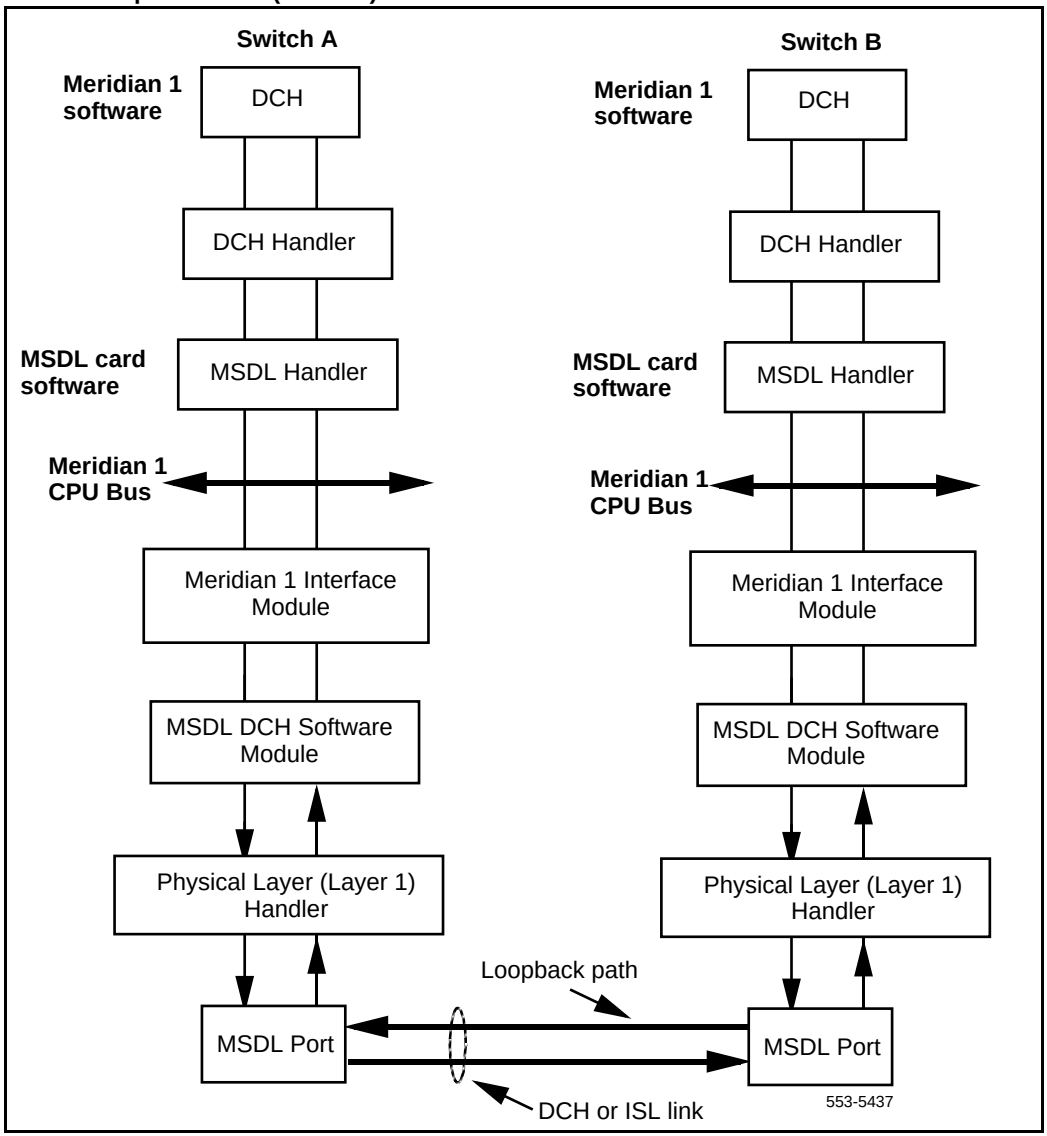
DIS MSDL x
SLFT MSDL x

7 If the card passed the test, the problem may lie in incompatible software. Refer to *Multi-Purpose Serial Data Link: Description* (553-3001-195).

After the test is complete, remove both sides from the test state:

DIS TEST x
DIS TEST y

Figure 13
Remote loopback tests (NT6D80)



Protocol log (PLOG)

The count of D-channel errors is stored in the Protocol Log (PLOG). The PLOG is printed by using LD 96 as shown in the PLOG status check below.

Protocol errors can be the result of:

- PRI transmission problems and re-start procedures, or
- a protocol mismatch with the far end

The PLOG counters are cleared after:

- the PLOG is printed, or
- the DCHI card is enabled

Note: When a protocol counter overflows, the PLOG is printed automatically and the counters are cleared.

When the PLOG has non-zero counters, check the PRI status and alarms as shown. See Table 16 for the PLOG.

Procedure 13
PLOG status check

1 Check the contents of the PLOG using the following:
LD 96
PLOG DCH x

Response:
DCH : XX MAINT CONFIRM TIME: <time of day>
COUNTERVALUE
1: 12
12: 8
20: 15
N: XX

2 If there are PRI bit rate or frame errors, assume there is a PRI problem.

3 If there is no problem with the PRI but there are a large number of protocol errors, report a protocol problem.

Table 16
Protocol log (Part 1 of 3)

Format	
DCH : XX MAINT CONFIRM TIME: <time of day> COUNTERVALUE	
Protocol counters	
1	count of missing PRI handshakes
2	count of peer initiated re-establishment link
3	count of unsuccessful retransmit N200 of SABME
4	count of unsuccessful retransmit N200 of DISC
5	count of N(R) errors
6	count of information fields with length greater than N201
7	count of undefined frames
8	count of information fields that are not allowed to contain information
9	count of FRMR frames received from the far end
10	count of CRC error frames received from the far end
11	count of REJ frames received from the far end
12	count of layer 3 messages with less than 4 octets
13	dummy counter, always zero
14	count of undefined layer 3 message types
15	count of layer 3 messages missing one or more mandatory information elements
16	count of layer 3 messages missing one or more undefined information elements
17	count of layer 1 reports of no external clock being received
18	count of aborted frames

Table 16
Protocol log (Part 2 of 3)

19	count of SABME frames received with incorrect C/R bit
20	count of supervisory frames received with F = 1
21	count of unsolicited DM responses with F = 1
22	count of unsolicited UA responses with F = 1
23	count of unsolicited UA responses with F = 0
24	count of DM responses with F = 0
25	count of times that no response was received from the far end after N200 transmissions retransmissions of RR or RNR
26	count of frames received with incorrect header length
27	number of times owner receiver busy condition was entered
28	number of times peer receiver busy condition was entered
29	count of messages with call reference length greater than 2
30	count of optional IEs received with invalid contents
31	count of mandatory IEs received with invalid contents
32	count of messages received with IE's not ordered correctly
33	count of IEs which were repeated in received messages, but are only allowed to appear once per message
34	count of IEs received with length exceeding the specified maximum length for the IE
35	count of layer 3 messages from far-end with invalid call reference flag value of 0
36	count of layer 3 messages from far-end with invalid call reference flag value of 1
37	count of layer 3 messages from far-end with invalid global call reference
38	count of layer 3 messages from Meridian 1 that are too short
39	count of layer 3 messages from Meridian 1 containing an undefined message type
40	count of layer 3 messages from Meridian 1 missing mandatory IE(s

Table 16
Protocol log (Part 3 of 3)

41	count of layer 3 messages from Meridian 1 containing unsupported IE(s)
42	count of layer 3 messages from Meridian 1 containing invalid operational IE(s)
43	count of layer 3 messages from Meridian 1 containing invalid mandatory IE(s)
44	count of layer 3 messages from Meridian 1 with IE(s) out of order
45	count of layer 3 messages from Meridian 1 containing repeated IE(s)
46	count of layer 3 messages from far-end with an invalid call reference length
47	count of layer 3 messages from Meridian 1 with an invalid call reference flag value of 0
48	count of layer 3 messages from Meridian 1 with an invalid call reference flag value of 1
49	count of layer 3 messages from Meridian 1 with an invalid global call reference
50	count of unexpected layer 3 messages received from the far-end
51	count of unexpected layer 3 messages received from the Meridian 1
52	count of unexpected layer 3 timer expirations
53	count of protocol messages received when D-channel is not in service or waiting for a Service Acknowledge message

Replace the DCHI

CAUTION
Firmly touch the metal frame of the cabinet to discharge static electricity from your body before handling circuit packs.

Procedure 14
Replace the DCHI

Step	Action
1	Disable the D-channel using: **LD 96** **DIS DCH N**
2	Disable the asynchronous port on the DCHI card (if equipped) using: **LD 48** **DIS ESDI N**
3	Set the ENB/DIS switch to DIS.
4	Disconnect cables on DCHI faceplate.
5	Remove the DCHI from the shelf.
6	Make sure that the new DCHI card switch settings are the same as the faulty DCHI card. See 553-2901-201 and 553-3001-211 for switch-setting information.
7	Install the new DCHI card in the appropriate slot.
8	Connect the faceplate cables to the new DCHI card.
9	Set the ENB/DIS switch to ENB.
10	Enable the D-channel using: **LD 96** **ENL DCH N**

Overlay 60 - Loop Maintenance for SYS-12, AXE-10, SWE, SWISSNET, NUMERIS, EuroISDN, NEAX-61, Asia-Pacific

If there is a loop configured with a SYS-12, AXE-10, SWE, SWISSNET, NUMERIS, EuroISDN, NEAX-61, or Asia-Pacific D-channel, Overlay 60 adds the D-channel type to the printout displayed upon entering the overlay. This printout alerts the technician to the relationship of the difference of the timeslot-to-channel mapping between the Meridian 1 and the D-channel type:

Table 17
Meridian 1 SYS- 12, AXE- 10 SWE, NUMERIS, SWISSNET, EuroISDN, NEAX-61 channel timeslot mapping

Channel	Meridian 1	Network	Timeslot
B-channel	1-15 16-30	1-15 17-31	1-15 17-31
D-channel	31	16	16

Clock Controller maintenance

Contents

The following are the topics in this section:

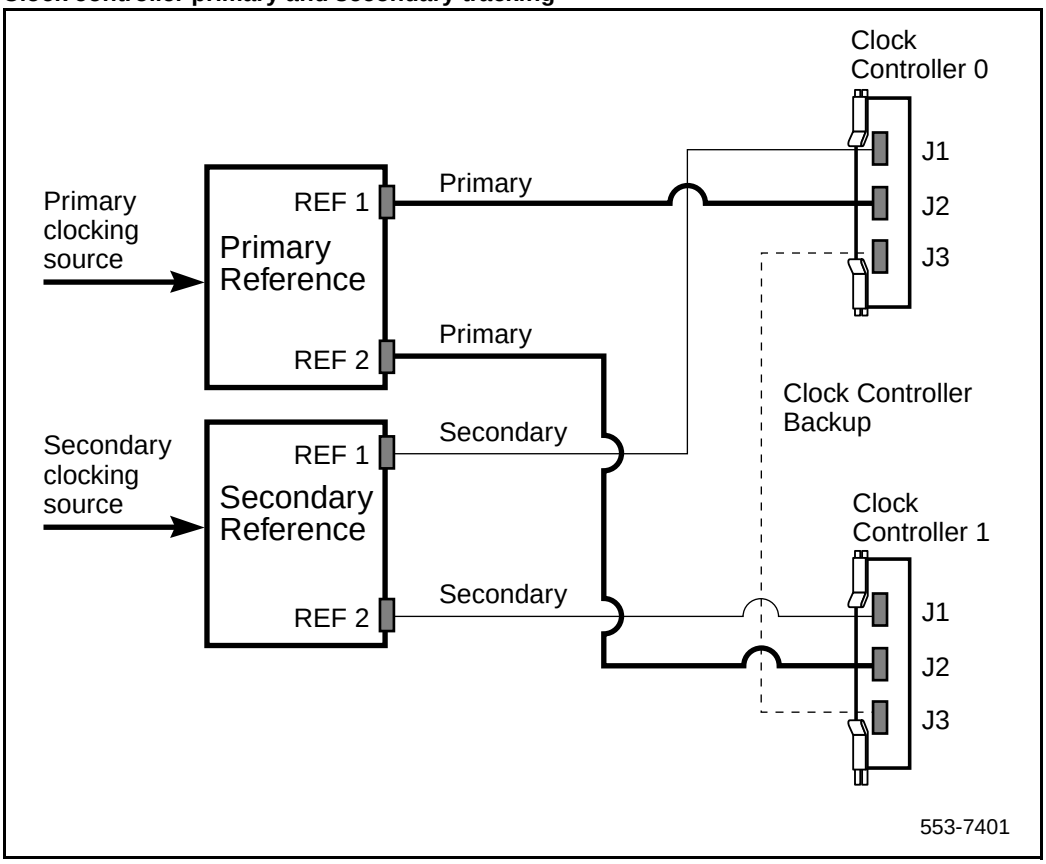
Clock operation

Tracking mode

In tracking mode, the PRI loop supplies an external clock reference to a clock controller (CC). See Figure 14. Two PRI loops can operate in tracking mode, with one defined as the primary reference source for clock synchronization, the other defined as the secondary reference source. The secondary reference acts as a back-up to the primary reference.

As shown in the Figure 14, an Meridian 1 system with a dual CPU may have two clock controllers (CC0 and CC1). One clock controller acts as a back-up to the other. The clock controllers should be locked to the reference clock.

Figure 14
Clock controller primary and secondary tracking



Free run (non-tracking) mode

The clock synchronization for a PRI loop may operate in free-run mode if

- the loop is not defined as the primary or secondary clock reference
- the primary and secondary references are disabled
- the primary and secondary references are in local alarm

Reference clock errors

Meridian 1 software checks every 0-15 minutes (programmable) to see if a clock-controller or reference-clock error has occurred.

In tracking mode, at any one time, there is one active clock controller which is tracking on one reference clock. If a clock-controller error is detected, the system switches to the back-up clock controller, without affecting which reference clock is being tracked.

A reference-clock error occurs when there is a problem with the clock driver or with the reference system clock at the far end. If the clock controller detects a reference-clock error, the reference clocks are switched.

Automatic clock recovery

An option for automatic clock recovery can be selected in LD 60 with the command EREF.

A PRI loop is disabled when it enters a local alarm condition. If the local alarm is cleared, the loop is enabled automatically. When the loop is enabled, clock tracking is restored in the following conditions:

1 If the loop is assigned as the primary reference clock but the clock controller is tracking on the secondary reference or in free run mode, it is restored to tracking on primary.

2 If the loop is assigned as the secondary reference clock but the clock controller is in free run mode, it is restored to tracking on secondary.

If the 15-minute clock check indicates the system is in free-run mode:

1 Tracking is restored to the primary reference clock, if defined.

2 If the primary reference is disabled or in local alarm, tracking is restored to the secondary reference clock, if defined.

Note: If the system was put into free-run mode intentionally by the craftsperson, it will resume tracking on a reference clock at this time. This occurs unless the clock-switching option has been disabled (LD 60, command MREF), or the reference clock has been "undefined" in the database.

Automatic clock switching

If the EREF option is selected in LD 60, tracking on the primary or secondary reference clock is automatically switched in the following manner:

1 If software is unable to track on the assigned primary reference clock, it switches to the secondary reference clock and sends appropriate DTC maintenance messages.

2 If software is unable to track on the assigned secondary reference clock, it switches to free-run mode.

Clock controller commands (LD 60)

Table 18
Clock controller commands in Overlay 60

Command	Description
DIS CC x	Disable specified system clock controller x (0 or 1).
DSCK L	Disables the clock for loop L.
DSYL L	Disables remote alarm processing for loop L.
ENL CC x	Enable specified system clock controller x (0 or 1).
ENYL L	Enables remote alarm processing for loop L.
EREF	Enables automatic switching and recovery of primary and secondary reference clocks when loops associated with these clocks are automatically enabled.
MREF	Disables automatic switching and recovery of the primary and secondary reference clocks when loops associated with these clocks are automatically disabled or in local alarm.
SSCK x	Provides status of system clock x (0 or 1). Indicates the active controller as well as active primary or secondary reference-clock source or free run.
SWCK	Switches the system clock from the active to the standby clock. The reference-clock source remains unchanged.
TRCK xxx	Set clock-controller tracking. Where xxx represents one of the following mnemonics: **PCK**track primary clock **SCLK**track secondary clock **FRUN**free-run mode

Replace the clock controller

Task summary list

The following is a summary of the tasks in this section:

1 Replace the clock controller. Refer to Procedure 15 on page 94.

CAUTION
Firmly touch the metal frame of the cabinet to discharge static electricity from your body before handling circuit packs.

CAUTION
Do not deviate from this procedure. Deviation will not cause the system to SYSLOAD or initialize, but will stop call processing.

Procedure 15
Replace the clock controller (Part 1 of 2)

Step	Action
1	Make sure that the clock controller card being replaced is associated with an inactive CPU. Switch, if necessary, using: LD 35 SCPU
2	Disable the clock controller card being replaced using: LD 60 DIS CC x

Procedure 15
Replace the clock controller (Part 2 of 2)

Step	Action
3	On the clock controller card being replaced, set the ENB/DIS switch to DIS.
4	Disconnect cables from clock-controller card being replaced.
5	Remove card from shelf.
6	Set the ENB/DIS switch to DIS on the clock-controller card being added.
7	Make sure that the switch settings are correct.
8	Install new clock-controller card in same slot as the defective card.
9	Reconnect cable(s) to clock-controller faceplate.
10	Set ENB/DIS switch on new clock controller to ENB.
11	Enable new clock-controller card using: **LD 60** **ENL CC x**
12	Verify normal service level; first, switch the active clock to standby using: LD 60 SWCK x If an error message results, refer to *General Maintenance Information* (553-3001-500) for the interpretation. ***Note:*** Switching clock controllers using LD 60 will generate ERR20 messages. These can usually be ignored, but avoid excessive switching, especially when counters are near the maintenance or out-of-service thresholds. Excessive switching can generate maintenance or out-of-service threshold messages, or cause the PRI to be disabled. Check the counters in LD 60. If necessary, reset the counters using the RCNT command.

Set switches

Before installing a Clock Controller, set the switches as shown in Tables 19 and 20. Table 19 displays the settings for different vintages of the QPC471. Table 20 shows the settings for the QPC775.

Table 19
Clock Controller switch settings for QPC471 vintage H

System	SW1				SW2				SW4			
51C, 61C	on	on	on	on	off	off	off	off	off	on	*	*
Cable length between the J3 faceplate connectors:												
0-4.3 m (0-14 ft.)											off	off
4.6–6.1m (15–50 ft.)											off	on
6.4–10.1m (21–33 ft.)											on	off
10.4–15.2 m (34–50 ft.)											on	on

• If there is only one Clock Controller card in the system, set to OFF. If there are two Clock Controller cards, set to match the cable length between the J3 faceplate connectors. Determine the total cable length (no single cable can exceed 25 ft.) between the J3 connectors. Both cards must have the same setting.

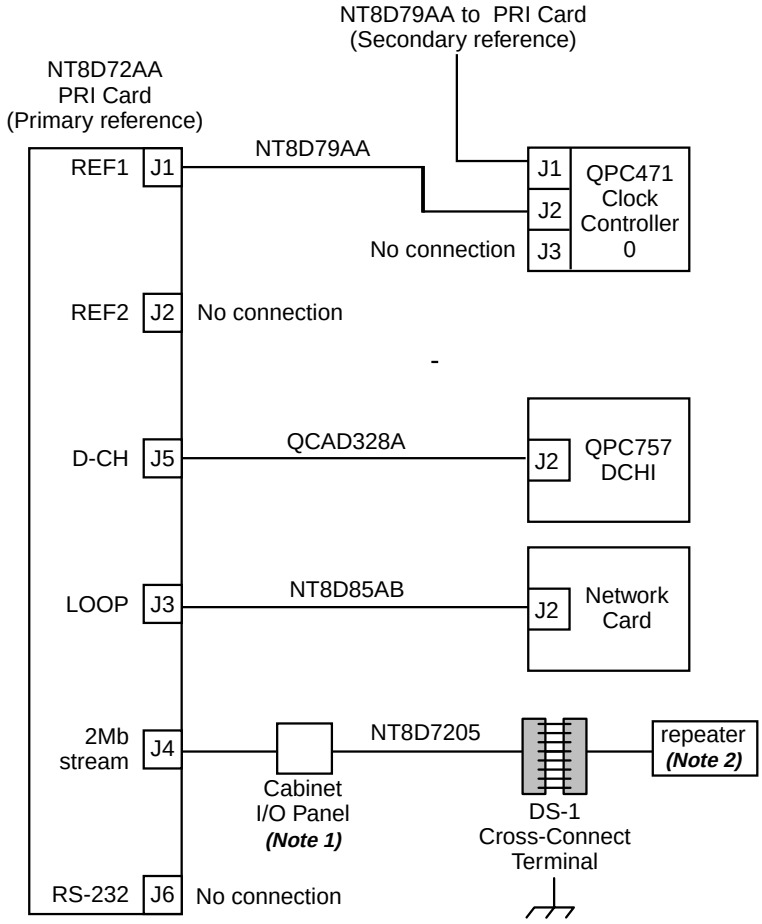
Table 20
Clock Controller switch settings for QPC775

System	SW2	SW3	SW4
51C, 61C	ON	OFF	ON
81C	OFF	OFF	ON

Clock controller cabling

The clock-controller cabling for Meridian 1 configurations is shown in the following diagrams. See Figures 15 to 17.

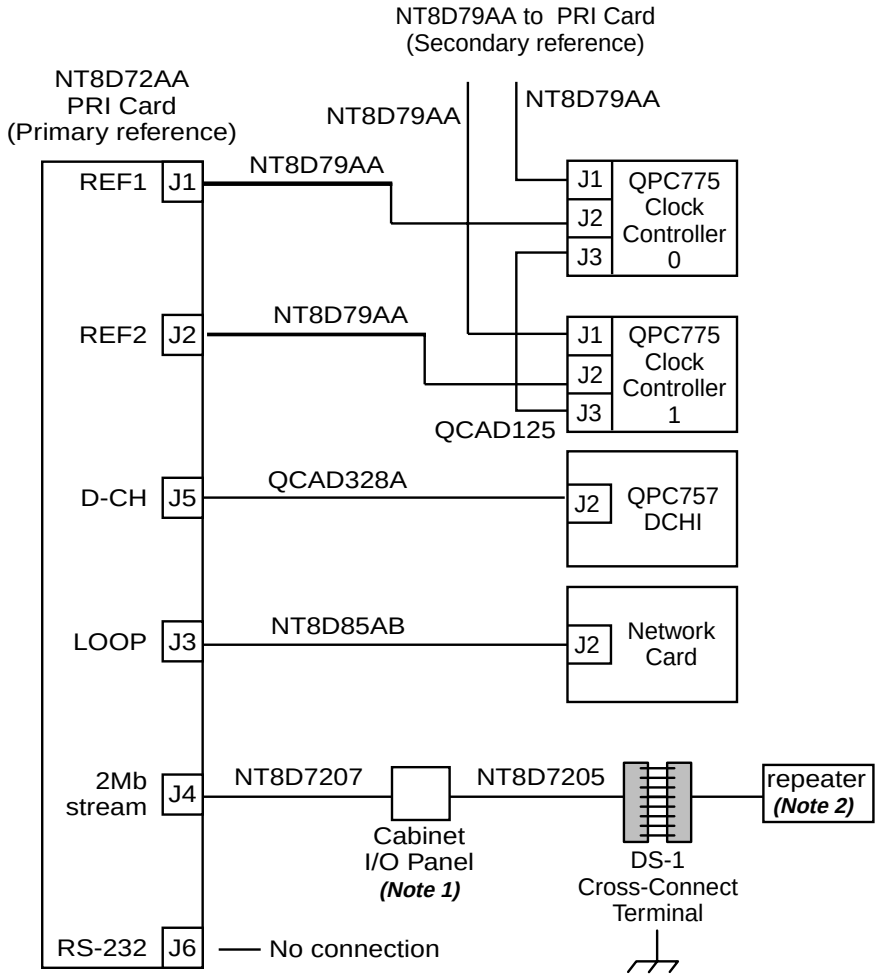
Figure 15
Clock controller cabling: Meridian 1 options 51C, 61C half-group systems



Note 1: Maximum cable distance from PRI card to cross connect is 200 m (655 ft) .
Note 2: Maximum cable distance from PRI card to repeater is 229 m (750 ft).

553-1389

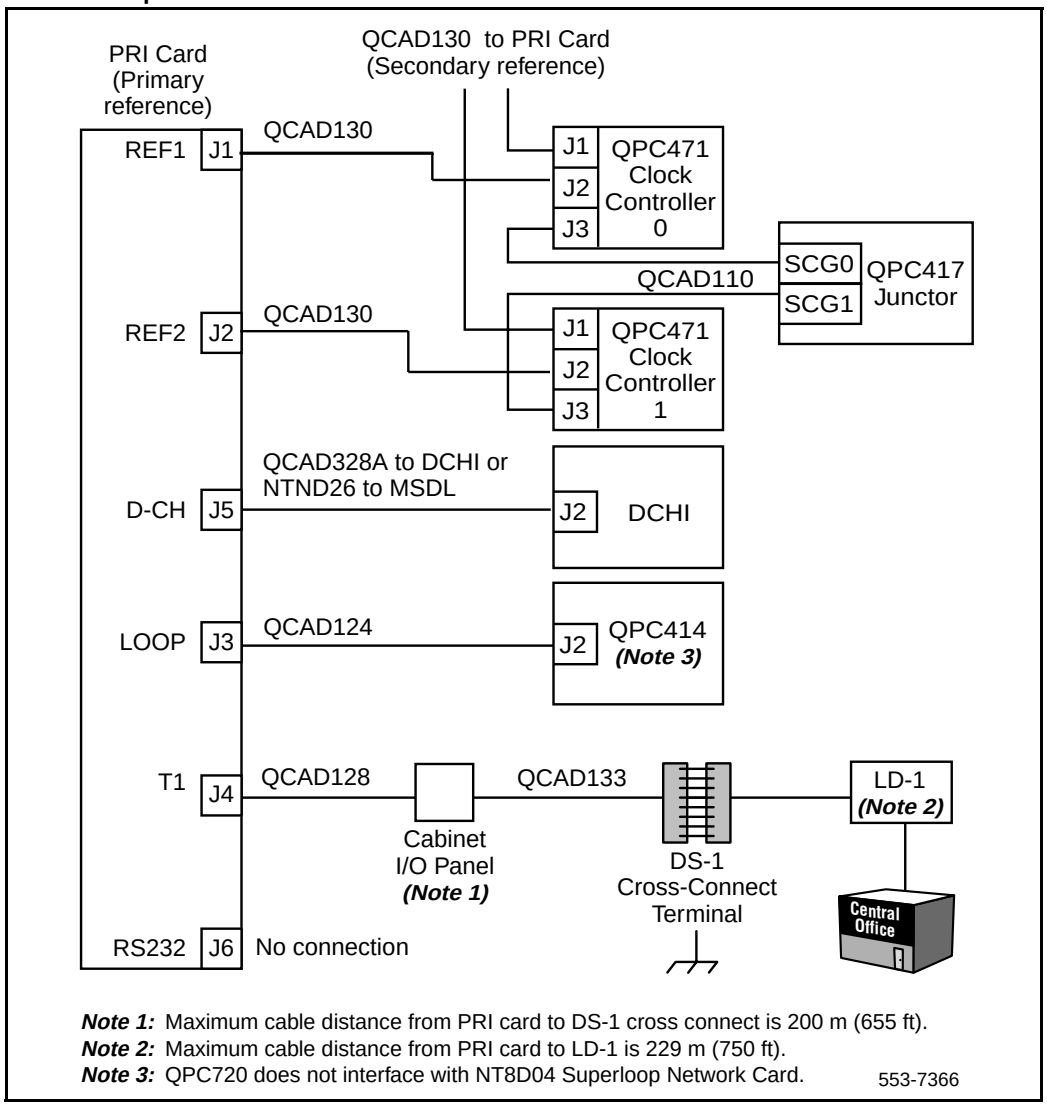
Figure 16
Clock controller cabling: Meridian 1 options 51C, 61C single-group systems



Note 1: Maximum cable distance from PRI card to cross connect is 200 m (655 ft) .
Note 2: Maximum cable distance from PRI card to repeater is 229 m (750 ft).

553-1391

Figure 17
Clock controller cabling
Meridian 1 option 81C



Note 1: Maximum cable distance from PRI card to DS-1 cross connect is 200 m (655 ft).
Note 2: Maximum cable distance from PRI card to LD-1 is 229 m (750 ft).
Note 3: QPC720 does not interface with NT8D04 Superloop Network Card.

553-7366

ISDN Signaling Link maintenance

Contents

The following are the topics in this section:

ISL status formats

If a trunk unit is controlled by the ISL feature, the STAT commands in LD 32 and LD 36 will do the following:

- indicate the trunk is an ISL trunk, and
- display the status of the D-channel

The display format is the same for both programs. See Table 21.

Table 21
ISL status check in LD 32 and 36

Command	Response
STAT L S C	UNIT 00 = IDLE ISL TRK D-CH <ch #> <status> UNIT 01 = IDLE ISL TRK D-CH <ch #> <status>
STAT L S C U	IDLE ISL TRK D-CH <ch #> <status>

When a trunk unit is controlled by ISL, the STAT L command in LD 60 indicates the trunk is an ISL trunk. The STAT L CH command indicates the trunk is an ISL trunk and displays the status of the D-channel. The display format is shown in Table 22.

Table 22
ISL status check in LD 60

Command	Response
STAT L	CH 1 = IDLE ISL TIE CH 2 = UNEQUIP
STAT L CH	CH 1 = IDLE ISL TIE?D-ch <ch #> <status>

Print programs (LD 20, 21, 22)

Print programs LD 20, LD 21, and LD 22 (see Table 23) provide the following ISL information:

- LD 20 prints trunk information

- LD 21 prints route information
- LD 22 prints configuration record information

Table 23
ISL prompts in LD 20, LD 21, and LD 22

Program	Prompt	Description
LD 20	CHID nn	Channel ID
LD 21	MODE ISL/PRI DCHI x	ISL or PRI service route DCHI port number (printed if MODE = ISL)
LD 22	USR PRI/ISL/SHA	D-channel for PRI only, ISL D-channel for (dedicated mode), or SHA= D-channel shared between PRI and ISL
	ISLM x	maximum number of ISL trunks

LD 21 also lists the ISL trunk terminal numbers (TNs) configured in the system and counts the number of ISL trunks controlled by the DCH (see Table 24). To list ISL trunk TNs use the following prompts:

REQPRT
TYPEISLL

Table 24
Additional ISL information provided in LD 21

Cust #	ISL Trunk TN	Channel ID	DCH #	Route #
xx	l s c u	xxx	xx	xxx
xx	l s c u	xxx	xx	xxx

ISL start-up

In general, the procedures for bringing up the D-channel are the same as the ISDN PRI interface (see the PRI start-up section). However, some additional procedures are required when ISL is configured in the dedicated mode using DTI or PRI trunks.

Dedicated D-channel using DTI or PRI

When the D-channel is configured in the dedicated mode using a DTI or PRI trunk, an Asynchronous Data Module (ADM), an Asynchronous/ Synchronous Interface Module (ASIM), or a High Speed Data Module (HSDM) is required between the DCHI or MSDL cards and the Data Line Card (DLC).

> ***Note:*** The configuration with a DTI or PRI meets Radio Frequency Interference (RFI) requirements. The RFI filter connectors are attached to the QCAD42A cable. To install the RFI filters, see the instructions for installing the EMI filters in the system installation documents.

The following signaling sequence is required between the DCHI or MSDL cards and the ADM, HSDM, or ASIM to establish the D-channel:

1 The ADM, ASIM, or HSDM is already powered up.

2 The ADM, ASIM, or HSDM raises clear to send (CTS) and data set ready (DSR) signals to the DCHI or MSDL.

3 The DCHI or MSDL raises the data terminal ready (DTR) signal to the ADM, ASIM, or HSDM.

4 The ADM, ASIM, or HSDM makes the hotline call (the programmed auto-dial DN) to the far end switch using a DTI or PRI trunk line, depending on the DN configured.

5 The call is established and the CONNECT lamp on the ADM, ASIM, or HSDM is lit.

6 The D-channel is established.

ISL recovery

The D-channel will go down if the following occurs:

- the modem, ADM, ASIM, or HSDM power is off
- the hotline call between the Meridian 1 and the modem, ADM, ASIM, or HSDM is dropped

The Meridian 1 system handles these possibilities in the following way:

1 The Meridian 1 CPU schedules a data link diagnostics program, which runs in background mode.

2 If this program finds that the link is not established, it requests the maintenance program to reestablish the data link by reinitializing the hotline connection.

3 The hotline call is brought up as it is during installation.

The ASIM can automatically reinitiate the hotline call with the Forced DTR option set to ON.

A modem with auto-dial capability is required to automatically bring up the D-channel in the configuration below.

Note: The Radio Frequency Interference (RFI) filter connectors are attached to the QCAD42 cable. To install the RFI filters, see the instructions for installing the EMI filters in the system installation documents.

Meridian 1

ISDN PRI

Maintenance

Information is subject to change without notice. Nortel Networks reserves the right to make changes in design or components as progress in engineering and manufacturing may warrant. This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC rules, and the radio interference regulations of Industry Canada. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.
SL-1 and Meridian 1 are trademarks of Nortel Networks.
Publication number: 553-2901-501
Document release: Standard 6.00
Date: January 2002
Printed in Canada

NORTEL NETWORKS™